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A Questionable Tie Severed

ANNOUNCEMENT by the Boston *Herald-Traveler* that the International Paper Company interests affiliated with the New England Power Association have agreed to dispose of their stock in these newspapers marks a significant turning point in public relations. That the paper company's newspaper-purchasing policy was a mistake has been apparent from the first to sensitive students of public relations. The stabilization of the newsprint market was the vigorously defended objective of this policy, but politicians, many newspapers and also some highly respectable opinion inside the electrical industry saw dangerous possibilities ahead. Public opinion has set a bumper on this track which has to be heeded. It is clear that the purchase of substantial interests in newspapers by even the best-intentioned public utility affiliate opens the door to abuses in case a management fails to live up to the highest principles. For this reason it is better to avoid even the appearance of evil by keeping out of such transactions.

If Consolidations Are Warranted, Tell the Public

THERE are ample and adequate reasons, from a public viewpoint, for most of the current consolidations in the utility field. They cannot and need not in all cases be explained by general claims about the economies of interconnection. Modern service demands and good business conduct make the assembly of the utilities into huge corporate units imperative.

But the amazing phase of the situation is that some interests initiating these consolidations prefer to leave the public in the dark with regard to what the reasons and possible public advantages may be. Rather than seize obvious opportunities of building good will and sympathetic public understanding, they are helping to develop an attitude of distrust and suspicion which is doing the industry no good. The opportunity for agitators to create a public demand for nationalization or for municipalization of sections of the industry increases with the growth of the merger movement, especially in such cases as appear to be of a purely banking nature, and every possible channel for getting the public to understand the reasons for mergers should be utilized.

It is difficult to see why the consuming public cannot to some extent be taken into the confidence of those who sponsor these movements, even though some mergers are exceedingly involved and difficult to explain in tangible terms. It should not be forgotten that the utility business involves a public interest as well as a business interest. The matter is not settled simply because the public, in its present frame of mind, will readily absorb virtually any utility securities offered. Other factors worth considering are next year's utility securities market, support from the consumers and public sympathy and good will. The public is a member of the utility household, and there is no real reason for not having a happy family.

Inadequate Wiring Continues to Imperil Development

IT WAS quite evident at the recent convention of the Illuminating Engineering Society that the members of that organization consider present wiring practices and the enlarged use of energy today or in the future to be seriously at variance. The illuminating engineers are pleading for more copper, better distribution coverage and adequate feeders for every new structure. Examples are not lacking to point the folly of failing to anticipate the future, for some structures erected so recently that they are scarcely completed can truly be viewed as definitely out of date electrically.

In an endeavor to correct this situation, which has been growing progressively more serious as electrical development becomes more rapid, at least three tangible schemes have been advanced: First, general publicity through advertising; second, close co-operation between architects and electrical interests in the form of "free service," opportunities for consultation and the checking or even submitting of electrical layouts; third, the creation of a special division of the utility organization to offer the same technical advice on this subject as does the telephone company. Any endeavor which will bring about the desired end is worth considering, but it is well to bear in mind that architects are skilled and thorough professionally and must remain the final

arbiters of their work. Any effort to interfere with their freedom of action is likely to prove disastrous. After all, there is no deep, dark secret about the matter, and the formulation of standard specification sheets periodically brought up to date should, as one architect said, take care of 90 per cent of the difficulties. Not minimum but desirable standards are needed.

Electrical engineers have created a complex mechanism so involved and full of unforeseen potentialities that the establishment of even the most optimistic of standards for wiring adequacy may prove woefully insufficient when the next development comes along. Present experiences with factories not so long ago wired under the direction of supposedly competent consultants and with new office and apartment buildings at whose sufficiencies one may well cast a skeptic's eye leave the ultimate standard but not the urgency uncertain. It is going to prove very expensive indeed to all interested if more adequate wiring practices are not thoroughly carried out at the time that new structures are built. The consumer loses through excessive voltage drop, involving higher unit costs for lighting and inability to make full use of electrical energy; the utility loses in volume of sales, as does the electrical manufacturer, and the great American public, for which utilities and manufacturers are rightly so concerned, has no little interest in the matter, since the metamorphosis of the world, in process of becoming vastly more interesting and amusing, is appreciably slowed down. The industry should strike hard at this problem, and a reasonable suggestion is a manual for adequate wiring kept up to date.

New York Buys Subway Power

THE largest city in the New World has concluded to buy from the largest single operating power company the largest block of power ever contracted for and at the simplest rate conceivable under the circumstances. The decision was arrived at after an exhaustive study of all the potential alternatives, and the commitment to purchase power was made strictly on the pure engineering economies of the situation.

There is hardly a community anywhere that would not harbor thoughts favorable to the building of a municipal power plant for traction or other power if it had presented to it the alluring load of 200,000 kilowatts or even a tenth of this amount. But New York City has chosen to forego this opportunity for political machination simply because it would not take the route which would be more expensive even in the long run.

The same motives and expediencies that prompted the city to build the greatly needed subways might easily have been used as the excuse for a municipally built and owned power plant to supply the equally indispensable traction power. However, the city has abided by the facts in the case, which are simply that this load, large as it looks in figures, is only equal to the normal increase in power growth of the New York Edison Company. As a consequence the rate itself, the general flexibility of adaptation of the company to the traction load, however it grows, and—better yet from the city's standpoint—the strikingly generous cancellation provisions, were all conducive to a favorable reception of the bid.

It may be that few other communities and power companies would find their local situations measurably comparable. Therefore there is no disposition to gloat over the defection from the municipal ownership cause of so important a "sustaining member" as the city of New York. What its citizens and the electrical industry can rejoice in is that it has lived up to its best traditions in basing an important decision upon the economic facts.

What Should Be Done with Natural Resources?

MIRACLES of cheap power in virtually unlimited quantities have led to the rebuilding of the world in an amazingly few years. It has become accepted very largely that development should continue to the economic limit, bringing electrical energy to lighten the toil of men and women, to produce needed manufactures, to light homes, offices and streets, and to perform untold tasks. Essentially this is a sound and worthy doctrine, for, whatever may be the real purpose of man's existence, the adapting of the forces and resources of nature to his needs, esthetic, spiritual or material, is his at present unchallenged prerogative. Water power is the present center of conflicting views.

While it is the easiest of tricks to damn all advocates of state development of water power as self-seekers and demagogues and to hurl the virtually meaningless epithet of "socialist" at them, it is scarcely fair. These people can no more be wholly wrong than their opponents can be wholly right. As pointed out by Thomas W. Lamont recently, it is entirely equable and fair that Maine or New York should, as commonwealths, want to know what is to be done with the power generated through the harnessing of watercourses within the state. It is right that these commonwealths should have a decisive voice about water power and should be permitted to make decisions as to water-power development.

Whether state or private enterprise is in responsible charge, however, progress should be defined in terms of something more than additional dollars for employer and employee to spend. Economic considerations are tempered by sociological ones. All our boasted idealism and far-sighted vision is pitifully dull when we view through the eyes of the hypothetical "man from Mars" forests torn asunder to make cheap wooden homes which will be demolished in a few years, or steel mills surrounded by a ravaged area in which no green thing will grow in order to make more motor cars to replace those that will never be worn out but merely scrapped.

or rural communities turned to bustling, dirty, unattractive towns because cheap power or labor dictates a purely economic development, thus forcing former mill towns in other sections to be deserted. Rivers should not become open sewers because it is easy to hurl refuse into moving water.

The viewpoint of tomorrow must inevitably be, if there are any natural resources left by then, "Yes, we understand that you want to develop water, or coal or iron, or clay resources, but how are you going to do it and what are you going to do with the materials? Shall we all be better off or not when you get through?" Progress is not bound up in money making. It is not comprised in "moving things from where they are to where they are not." It should always mean a step forward in the attainment of permanent values.

An enlightened industry will develop water power in the light of true progress and will help put all real values in the scales for the public weighing. The electrical industry should be the leader in such a conception of the development of this natural resource. If it prove to be so, there is no doubt that the public decision will be in favor of private enterprise.

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Synchronous-Motor Drives Popular

PROGRESSIVE engineers are constantly on the alert to apply power in the form of electric motor drives more efficiently. To them the word "efficient" has come to mean a great deal more than the strict engineering use that involves only "the ratio of output to input." In determining to what degree a machine is efficient the present-day engineer considers first cost, space occupied, continuity of service, operating expense, length of life and suitability for the service intended—and these are points that are kept in mind when investigating the relative merits of possible installations with a view to determining which is the most efficient.

Synchronous-motor drives have opened in recent years an almost unparalleled opportunity for improvement in efficiency in the use of electric power. Virtually in the last decade the great advantages of the direct-connected synchronous motor, available in a wide range of speeds, have become generally and sufficiently understood to drive out, on many drives of major importance, the long-prevailing practice of using high-speed motors with speed-reducing units.

Synchronous-motor drives now comprise about 20 per cent of the total installed horsepower in America. An article in this issue designed to aid in the proper consideration and selection of the present-day synchronous motor sets forth briefly its advantages, characteristics, limitations and applications.

Early synchronous-motor designs were based on the use of inverted alternators, and lack of starting torque permitted their application only to loads with light starting duty or loads which could be started by auxiliary means. Widespread application of synchronous motors began when they were provided with squirrel-cage windings in the rotor pole faces. Operating as induction motors during the starting period, they could start and accelerate at least a part of full load to the speed required for synchronizing.

A factor which has played a large part in increasing the popularity of the synchronous motor is the preferential rate offered by many power companies for maintenance by customers of high plant power factor. The synchronous motor, incorporating the double function of a driving motor and unity or leading power-factor operation, enabled power users to take advantage of the reduction in electric power bills provided by the power-factor clauses.

The synchronous motor is worthy of serious consideration for constant-speed industrial drives requiring more than 20 hp. for the following important reasons: (1) It operates at absolutely constant speed; (2) it can be directly coupled to the load at all speeds with highly efficient operation; (3) it operates at unity or leading power factor; (4) it operates at a high electrical efficiency at all speed and horsepower ratings; (5) it is of simple, rugged construction; (6) on applications to which it is suited its cost is competitive with or lower than that of other types of drive.

The less favorable characteristics and limitations of the motor are its starting performance under loads of severe starting duty which cannot be unloaded and its limitation with respect to variable speed.

Thousands of synchronous motors operating under all kinds of plant and service conditions and on virtually all constant-speed industrial applications requiring from approximately 20 hp. to the largest horsepower ratings furnish abundant proof of the growing appreciation of their advantages and economies.

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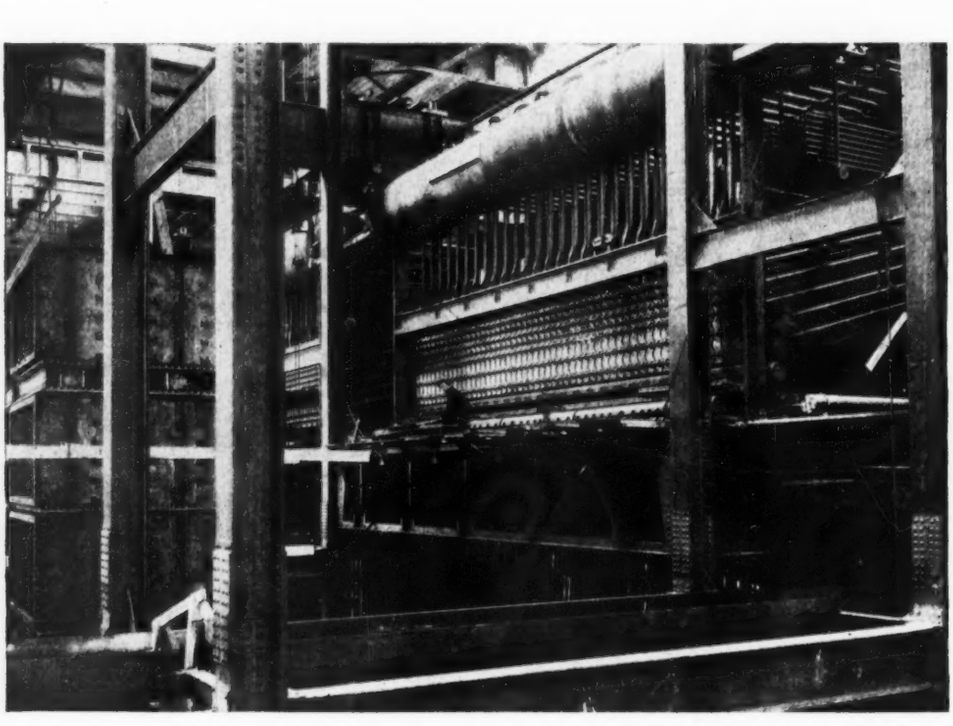
Beware the After Costs

FAILURE to clean up after a construction job may result in considerable extra expense that could be avoided if construction foremen were impressed with the seriousness of such oversight. This is particularly true of transmission construction because the lines run across or adjacent to many landowners' property. For example, a careless workman who forgets to repair a hole made in a fence may be the cause of a damage suit because some farmer's blooded cattle thus released gorge themselves to death on succulent young corn. Or the nails protruding from a broken insulator crate may pierce the calloused heel of the well-known barefoot boy as he saunters through the field.

When a transmission line is finished there should remain on no farmer's property anything more than the line structures themselves. Moreover, the improvements on any owner's property, such as fences and drainage ditches, should be left in at least the same and preferably in better shape than before the line was built. Only thus is it possible to avoid troublesome after costs.

Deepwater Nears Completion

HIGH-PRESSURE station which will supply steam and electric service to nearby industrial plant as well as generate electrical energy for its joint owners, United Gas Improvement and American Gas & Electric Companies, nears operating status on the banks of the Delaware River in New Jersey. Stevens & Wood, Inc., is designing and constructing this unusual plant. A detailed description and outline of underlying engineering reasoning appeared in the May 11, 1929, issue of ELECTRICAL WORLD.



Rear End of Boiler Showing Water Walls and Preheater in 1,200-Lb. Pressure Station

Modern Synchronous Motors

Developments in design. Motor characteristics and ratings. Control features. Discussion of torque and power factor. Applications increasing

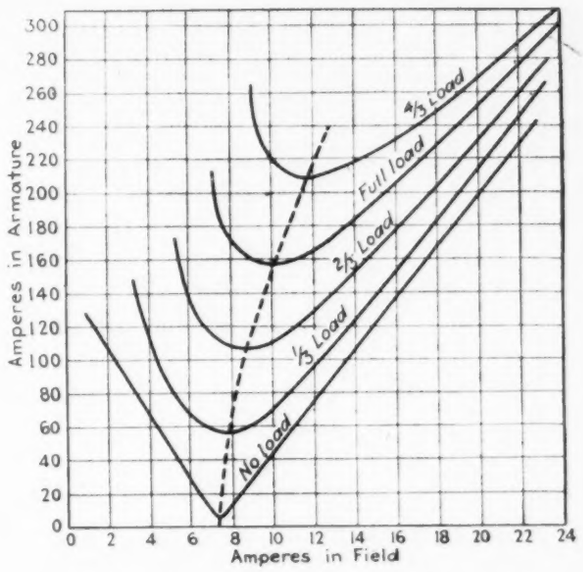
By W. H. FELDMANN

Electric Machinery Manufacturing Company, Minneapolis, Minn.

THE inherent characteristics of synchronous motors make possible most economical and satisfactory operation in speeds ranging from 1,800 r.p.m. down to 72 r.p.m. Induction motors, however, below 600 r.p.m. suffer a great handicap in performance because of design limitations. The poor performance of slow-speed induction motors is of sufficient importance to cause the use of this type of motor, when driving slow-speed machines, to be restricted to high-speed motors with mechanical speed-reducing mechanisms, such as belts, chains or gears.

The elimination of all forms of mechanical speed reducers, in so far as it is possible, is constantly sought by operating engineers. Experience has taught that the elimination of every possible step in the conversion of power in their plant means the elimination of possible causes of maintenance expense and interference with continuous production. Operating efficiency is of prime importance in industries where the cost of power is a substantial part of the total operating cost. The power loss in mechanical speed-reducing mechanisms varies from 2 per cent to 15 per cent of the total power transmitted.

Synchronous motors, coupled directly to the shaft of the driven machine, require a minimum of floor space. Slow-speed, direct-connected synchronous motors permit the elimination of speed-reducing devices and the elimination of mechanical stresses set up by high rotative speeds, insuring long life and permanency of the high initial drive efficiency.



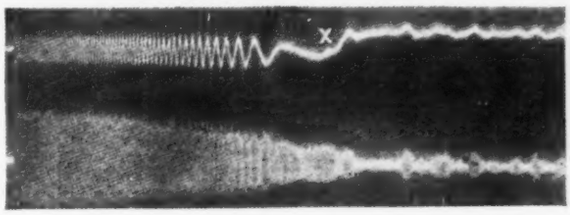
Excitation Curves of a Typical Synchronous Motor

HIGH POWER FACTOR OPERATION

If the direct-current excitation of a synchronous motor driving a constant load is varied, the current input to the armature follows the characteristic V-curves. This important characteristic permits operation of a synchronous motor at unity power factor with a minimum armature current or leading power factor to deliver a leading current which will compensate the lagging or magnetizing current of induction motors and other lagging power factor equipment on the same circuit. Whether power is purchased or generated the maintenance of high plant power factor will result in economies. Often there is reduction of power costs through preferential power rates of 5 per cent to 15 per cent of the total bill. The beneficial effect on voltage regulation is in many cases of great importance.

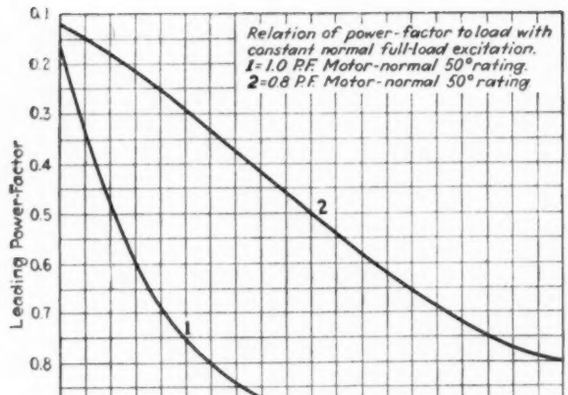
Application of synchronous motor drives nearly always involves consideration of the amount of power-factor correction necessary or desirable.

Synchronous motors are built standard for unity and 0.8 leading power factor operation, although motors for operation at other leading power factors are readily obtainable. The leading power-factor motor is really an oversize motor with an armature winding designed to carry the increased armature current and a field winding suitable for the increased excitation to produce leading power factor operation. Because it incorporates the double function of a driving motor and source of corrective kva., the leading power-factor motor corrects power factor at a low cost. Leading power factor synchronous motors have efficiencies one to three points lower than unity of power factor motors, hence a somewhat increased



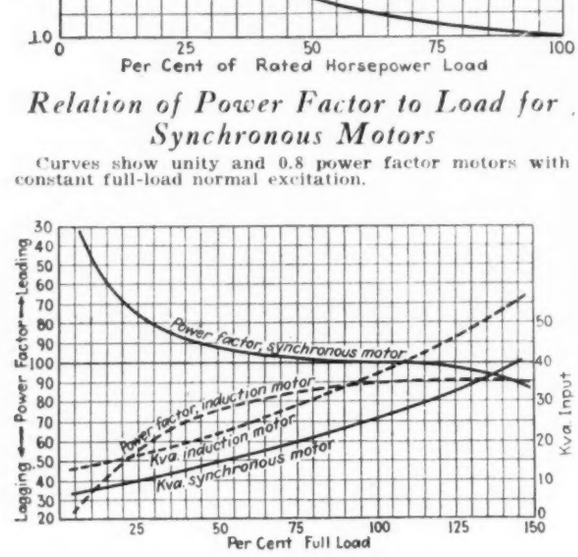
Current in Field and Armature of a Synchronous Motor During Starting

At point X (a frequency of 3 cycles) the frequency relay applied field excitation and the motor synchronized.



Relation of Power Factor to Load for Synchronous Motors

Curves show unity and 0.8 power factor motors with constant full-load normal excitation.



Comparison of Synchronous and Induction Motors

Solid lines show 30-hp., 327-r.p.m. synchronous motor. Dotted lines show 30-hp., 1,200-r.p.m. induction motor. Both are 220-volt, three-phase, 60-cycle machines and synchronous motor excitation is constant at full load value.

operating cost. Unity power factor synchronous motors are generally used except where power factor conditions require a source of corrective kva. In this case the higher first cost and greater operating cost of the leading power factor motor are compensated by the advantages of plant power factor correction.

Table I shows a comparison of the electrical and physical characteristics of the unity and leading power-factor motors. At no-load or part-load operation a synchronous motor has an advantage from the standpoint of power factor as compared to the induction motor, which operates at a lagging power factor at partial loads.

High Power Conversion Efficiency

In the high speeds, and with exciter losses taken into account, the synchronous motor shows a slight advantage in efficiency over the induction motor. For lower speeds the synchronous motor gains advantage in efficiency over the induction motor, until at very low speeds the induction motor becomes impracticable in this respect, while the synchronous motor remains quite satisfactory. At part loads synchronous motor efficiency remains high. The efficiency curve remains fairly flat between full and half load.

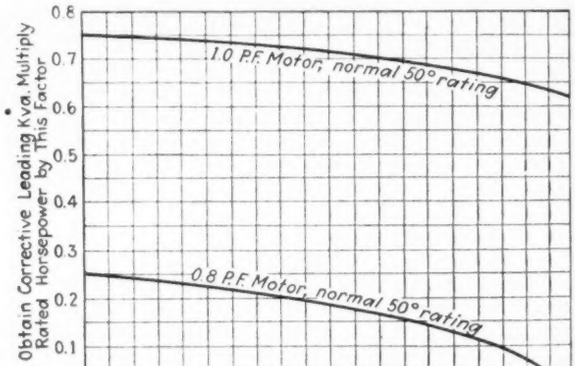
For a given horsepower rating the full-load efficiency becomes somewhat lower at slow speeds than it does at high speeds, but slow-speed, direct-connected synchronous motors will in nearly every case show a higher rate of efficiency than does a high-speed motor with speed reducer.

Starting Characteristics

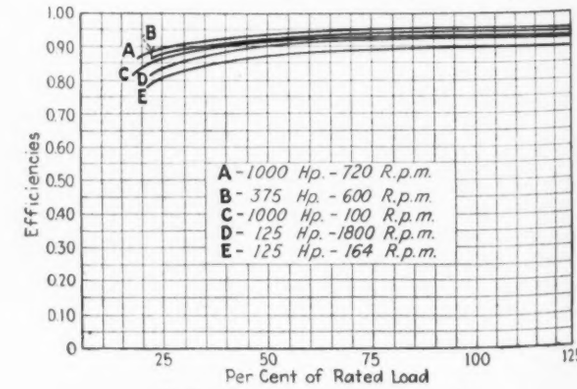
The starting torque obtainable in the modern synchronous motor is quite surprising. Most of the limitations in applying the motor because of insufficient starting torque have been overcome, both by improvement in starting torque characteristics and by use of easily operable unloaders. In some instances sufficient starting torque is obtained by application of leading power-factor motors, and because of the double function of the motors, this procedure is correct from the engineering and economic standpoints.

The synchronous motor is started by means of a squirrel-cage winding imbedded in the rotor pole faces and up to nearly synchronous speed operation is to all intents exactly like an induction motor. The starting-torque characteristic curves are then those of a squirrel-cage induction motor. In obtaining the proper starting torque the synchronous motor designer actually designs an induction motor of the required characteristics. Because the induction-motor winding functions only during the starting period, however, he is not so limited by considerations of heating and efficiency.

The motor-starting torque curve divides itself into two parts, the starting or breakaway torque and the pull-in torque, or induction motor torque at about 95


To Obtain Corrective Leading Kva. Multiply Rated Horsepower by This Factor
1.0 P.F. Motor, normal 50° rating
0.8 P.F. Motor, normal 50° rating
Per Cent of Rated Horsepower Load

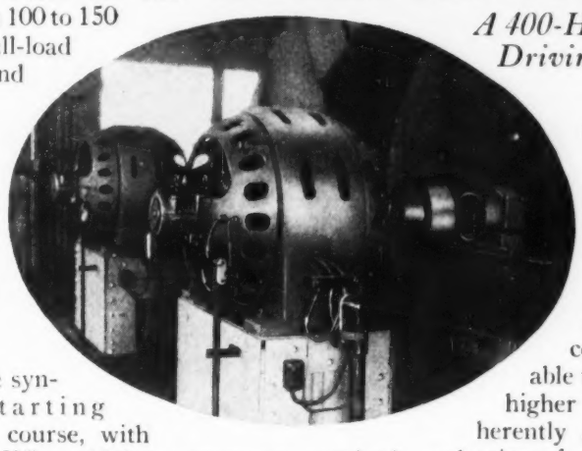
Leading Kva. Output of Unity and 0.8 Power Factor Synchronous Motors in Relation to Load



Efficiencies of Typical Synchronous Motors

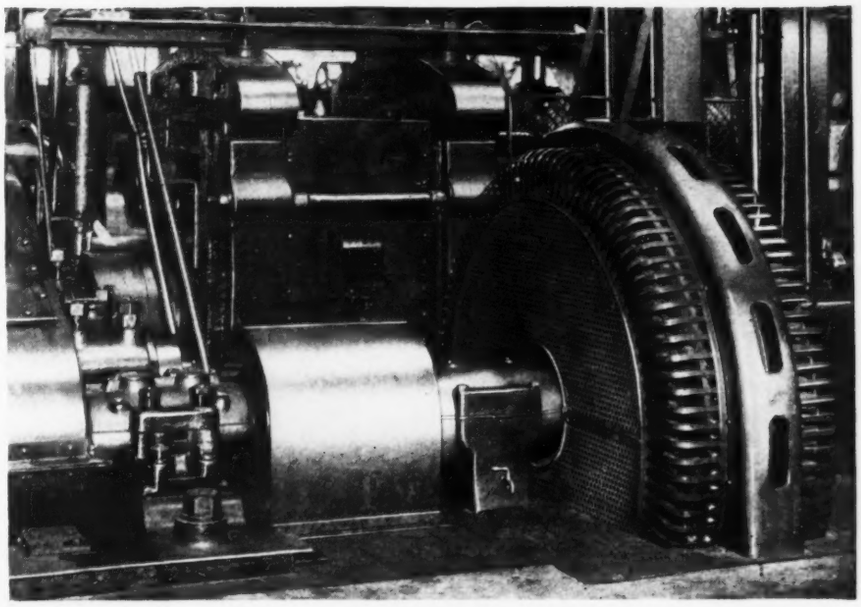
per cent synchronous speed. The requirements of the two are conflicting. For high starting torque a high-resistance cage winding is necessary, while for high pull-in torque a low resistance cage winding is required. The actual design is therefore in rotors with single cage winding, somewhat of a compromise between the required torques. In most cases the rotor winding must be individually designed for requirements of the application. However, by proper squirrel-cage winding design sufficient torque can be obtained for most of the industrial applications.

In general, the starting torques obtainable in synchronous motors are equal to or better than those of a squirrel-cage motor of equivalent speed rating. The standard high-speed squirrel-cage motor on full voltage develops from 100 to 150 per cent of the full-load torque on starting and this is obtained in the synchronous motor. Starting torques decrease, of course, with lower speed ratings. Where higher torques are required modifications of the cage windings and utilization of torque due to the field winding enable considerably higher values to be obtained.



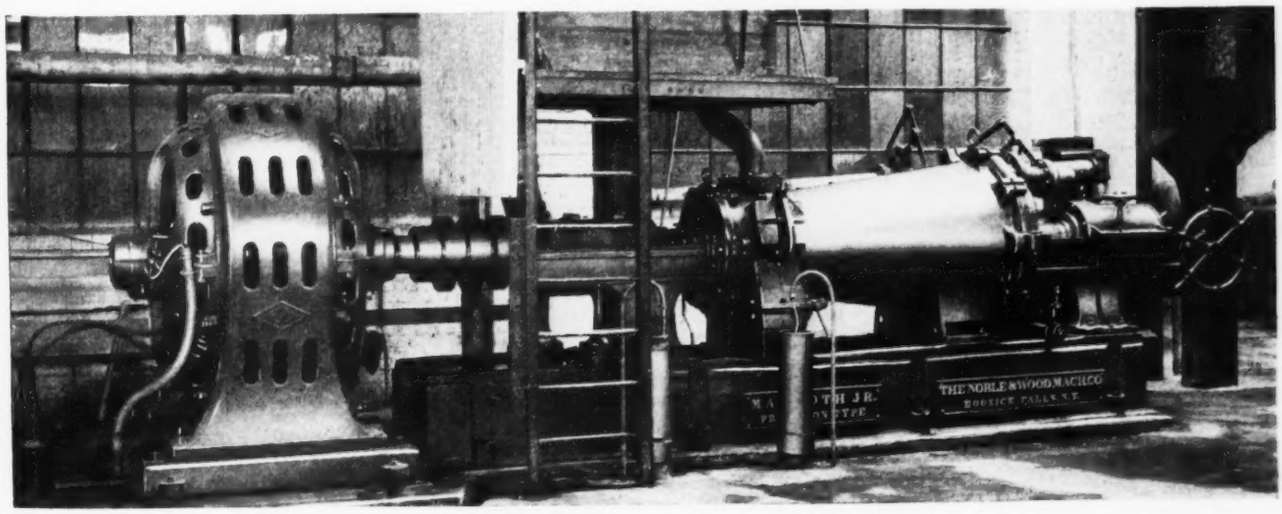
Two 100-Hp., 900 R.p.M. Synchronous Motors Driving Centrifugal Fan Driers

Allied with starting torque is the consideration of starting current. The current inrush at starting can be varied quite widely in the motor design and will in many instances be determined by the starting torques required. As with high-speed induction motors, the inrush current at full voltage is from five to seven times rated current. In the slower speeds the inrush at full voltage is low, from 225 to 275 per cent of normal current. This low starting current makes possible, for a major part of the synchronous motor applications, the use of full-voltage starting with its attendant simplicity and lower cost for starting equipment and makes available the entire starting torque of the motor. For higher speed motors, where starting torque is inherently ample, reduced-voltage starting permits a reduction of current inrush.



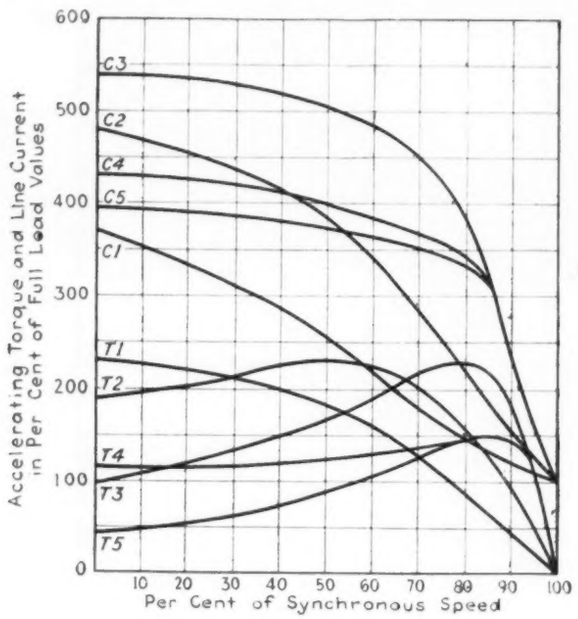
A 400-Hp., 300 R.p.M. Synchronous Motor Driving Rolls in a Copper and Brass Mill

The pull-out torque varies with the motor design and speed rating from 140 per cent to 150 per cent for unity power-factor motors. It is of course higher for leading power-factor motors. In the modern synchronous motor pull-out torque characteristics are sufficient to handle extremely severe peaks and momentary loads and to carry rated load with considerable reduction under normal voltage.



A 200-Hp., 400 R.p.M. Synchronous Motor Driving a Jordan in a Paper Mill

The necessity of a separate source of excitation is one factor which has prevented the commercial development of synchronous motors in horsepower ratings below 20. The effect of the excitation requirement on the simplicity of the synchronous motor is, however, slight; the motor requires only two slip rings to carry the low-voltage excitation current. Where the plant requires direct current for other purposes it is of course available for motor excitation, otherwise it is furnished by a direct-current generator of small size, driven by an induction motor, direct connected to the synchronous motor shaft on high-speed machines or belt-driven in the case of slow-speed motors.



Torque and Line Current for Synchronous Motors

Different designs of cage windings are used. The *C* curves correspond to line current for the *T* torque curves.

Motor Control and Protection

Starters for synchronous motors must: (1) Connect the motor to the line, either at full or reduced voltage; (2) apply field excitation at the proper speed for synchronizing. In addition, they should completely protect the motor from abnormal line or load conditions, remove field excitation when the motor is shut down and have the proper indicating instruments to permit best operation. It is also desirable that the starter should automatically remove excitation when the motor is out of synchronism, so that resynchronizing will take place automatically if motor torque characteristics permit. Obviously the foregoing are obtained completely only in the automatic starter.

Automatic control has the advantage of greater dependability through assurance of correctness in the starting operation and because of better protection of the motor from abnormal conditions. Push-button control permits starting by untrained help and allows the advantages of remote control, float switch control, pressure control, etc. With automatic control the operator cannot impose undesirable conditions upon either the starter or motor. It also enables the operator to devote his attention to the machine being started without being concerned with the starting of the motor.

Table I—Comparison of 0.80 and Unity Power Factor Motors

	Values shown in body of table are for an 0.80-power factor motor as compared with: (A) Same size motor at unity p. f. (having higher hp. rating).	(B) Smaller motor at unity p. f. (having same hp. rating).
Horsepower Rating	30% lower	Same
Efficiency	2 to 3% lower	1.5 to 2.5% lower
Power Required for Excitation	50 to 60% higher	70 to 90% higher
Starting Current Drawn from Line Total Amperes Amp. per hp. of rating	 Same 40 to 50% higher	 40 to 50% higher 40 to 50% higher
Starting and Pull-in Torque Total lb.-ft. Lb.-ft. per hp. of rating	 Same 40 to 50% higher	 40 to 50% higher 40 to 50% higher
Pull-out Torque Total lb.-ft. Lb.-ft. per hp. of rating	 50 to 60% higher 110 to 140% higher	 110 to 140% higher 110 to 140% higher
WR^2 to give same current variation when operating compressor	30 to 35% higher	90% higher
Outside Diameter	Same	0 to 25% higher
Weight	2 to 3% higher*	10 to 50% higher

* Due to additional copper in field coils.

Whether full or reduced-voltage starting shall be used will depend upon several factors. Torques that the motors must develop to start and accelerate the connected load to synchronous speed, starting current with full voltage applied to the motor terminals and its effect on the power circuit to which the motor is connected and conditions imposed by the driven load must be considered.

Full-voltage starting is now used almost exclusively

Table II—Comparison of Synchronous and Induction Motors

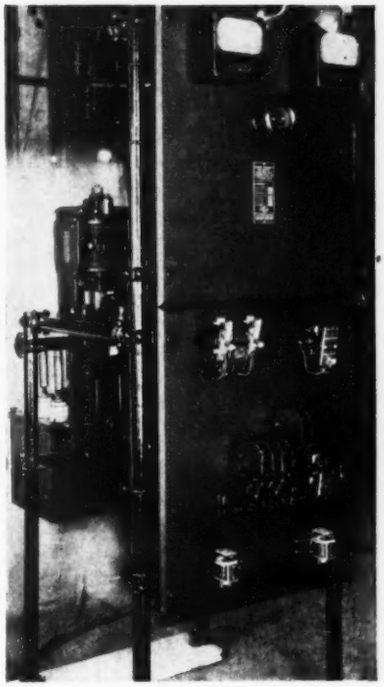
	Squirrel Cage Induction	Slip Ring Induction	Synchronous
Stator Winding	Form wound insulated coils placed in slots.	Same.	Same, except that for equal rating there are usually fewer coils, thus providing air space between ends of coils, and minimum breakdown at this point.
Rotor Winding	Squirrel cage winding carries starting and running current	Form wound insulated coils placed in slots, carry starting current at high voltage and running current at low voltage.	(1) Squirrel cage winding carries starting current only. (2) Definite pole, low voltage, direct current exciting winding, easy to insulate, carries relatively small constant running current, regardless of load.
Slip Rings	None.	Three, that carry starting current at high voltage and running current at low voltage.	Two, that carry direct current excitation at low voltage.
Air Gap	Small.	Small.	Three to five times greater than that in induction motors.
Automatic Control	Three switches starting, magnetizing, and running; an auto-transformer; three control relays and two overload relays.	Three or more switches—one primary and two or more to cut out secondary resistance; four or more operating relays and two overload relays; resistance grids.	Usually starts on full voltage, hence, one switch for starting and running duty; a field contactor; two operating relays and two overload relays.

with medium- and slow-speed motors. It allows a simpler and less expensive starter with fewer parts and hence less maintenance. Full-voltage starting is, in general, finding favor with the power companies because it shortens the time of starting and eliminates the second "bump" on the line caused by reduced-voltage starters when transferring from reduced to full voltage.

The best starting performance for the synchronous motor depends on application of the direct-current excitation at the proper speed for pulling the motor into step or synchronous speed. The speed range during which excitation should be applied is quite limited. A control, therefore, sensitive to the motor speed and unaffected by load or time conditions is desirable. The frequency-relay automatic starter for synchronous motors utilizes the declining frequency in the field winding during starting to operate the control and, as shown by the accompanying oscillogram, functions to apply direct-current excitation at the proper speed for synchronizing. Starters of the frequency-relay type also remove the field excitation when the motor drops below synchronous speed, permitting the induction-motor torque to resynchronize the motor after a momentary power dip or on removal of a momentary overload. This feature is of great importance to insure continuous operation.

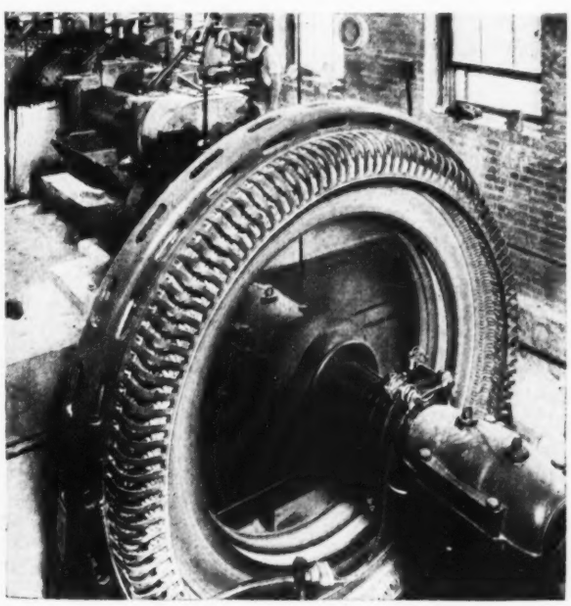
Synchronous Motor Applications

The wide variety of applications to which synchronous motors are applied indicates in general their suitability for all types of industrial drives. For ammonia, carbon dioxide, air and other gas compressors the inherent slow-speed operation of the compressors makes the direct-connected synchronous motor extremely suitable and economical. Fans and blowers for supplying large volumes of air at low pressure and operating at speeds ranging from 100 to 1,800 r.p.m. are all very suitable direct-connected synchronous motor applications. Pumps of every type are successfully driven by synchronous motors with advantages in efficiency and power factor improvement. Typical of the extremely heavy service conditions to which synchronous motors are suitable is their application on crushers of all types. For cone, gyratory and hammermill crushers synchronous motors of required torques are available and are now in successful operation. A wide field of application for synchronous motors is offered by the metal-rolling industry. The slow speed of roll drives and the advantages of elimination of interconnecting units makes this application a most economical one for the synchronous motor. Above 35 kw. it is almost universal practice to use synchronous motors for driving motor-generator sets. The absolutely constant speed of synchronous motors is reflected in better regulation of the generator voltage. Synchronous motors are available for all types of mill line drives, notably those in rubber mills. Here synchronous motors are applied to mill lines, Banbury mixers and other miscellaneous applications.



Frequency Controlled Full-Voltage Synchronous Motor Starter

The pulp and paper industries are large users of synchronous motors. The motors are applied to grinders, beaters, jordans, pulp screens and other mill applications. The synchronous motor also finds wide use in cement mills for driving tube mill pulverizers, air compressors and direct-current generators. Other applications of the synchronous motor are line-shaft drives, vacuum-pump drives, hog drives and other miscellaneous drives peculiar to various industries and for which synchronous motor characteristics are inherently suitable.



A 250-Hp., 100 R.p.M. Motor Driving Mixing Rolls in a Rubber Mill

Standby Losses of Electric Furnaces Readily Computed

FORMULAS have been developed for very accurate calculation of heat losses through furnace walls, but no simple formulas are satisfactory for calculating the heat loss through the furnace front and doors because so much depends on design and workmanship. For furnaces of average size having one door and at least 9 in. of insulation the standby losses can be fairly accurately determined by the formula:

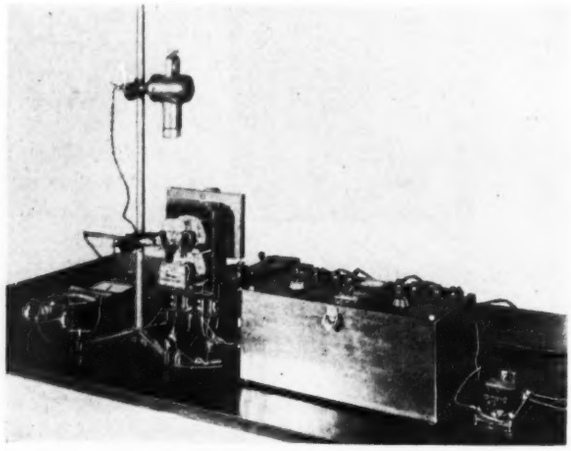
$$\frac{\left\{\begin{array}{l}\text{Total square}\\ \text{feet of}\\ \text{inside area}\end{array}\right\} \times \left\{\begin{array}{l}\text{Furnace}\\ \text{temperature}\\ \text{in deg. F.}\end{array}\right\}}{10{,}000} = \left\{\begin{array}{l}\text{Kilowatt-hours}\\ \text{per hour of}\\ \text{standby loss}\end{array}\right\}$$

This does not include the losses from opening the door nor does it apply to small standard stock sizes, for which the losses are usually catalogued by the manufacturers.

Watt-Hour Meters Checked by Selenium Cell

By H. R. Richardson
Laboratory Engineer Brooklyn Edison Company, Inc.

AN IMPROVED method of making code tests and research investigations on watt-hour meters has been developed in the research bureau laboratory of the Brooklyn Edison Company, Inc. By means of a light-sensitive cell a record is obtained automatically of meter revolutions with corresponding reduction in manual operation so that one operator can obtain tests more rapidly and with greater accuracy than in the usual two-man test with one man adjusting load and the other timing the meter with a stop watch or synchronous timer.



Laboratory Investigations Simplified by Light-Sensitive Cell

The arrangement of the meters and apparatus, except the chronograph and the standard wattmeter with load control, is as shown in the accompanying illustration. The meter is set up with the cover removed and a lamp with condensing lens is mounted above so as to direct a beam of light through one of the anti-creep holes in the disk. Below the disk a light-sensitive selenium cell is mounted in a case which cuts off excess rays of light. In some meters the small available space makes it desirable to deflect the light beam by means of a small right-angled prism and to place the cell at one side of the meter. This arrangement results in a light flash on the cell each time one of the anti-creep holes passes through the light beam. By closing one of these holes with a film of black varnish the flashes can be reduced to one for each revolution of the meter.

Various means may be used for amplifying the output of the light cell to a suitable value for operating the magnet on a recording chronograph, but it has been found that for this purpose one of the most useful circuits is that described by Nicholas Minorsky in the *Proceedings* of the Franklin Institute for February, 1927. This amplifier makes use of certain characteristics of an inherently unstable circuit, so that very small changes in input voltage near the critical points will cause large and abrupt changes in the output. In the method employed in this case the light-sensitive cell is the vacuum selenium type made by the Electric Bean Grader Products Corporation. This is connected in series with a resistance of about 10,000 ohms and a single cell dry battery. The change in drop across the resistance is used as an input to the amplifier, which gives a change of up to 80 milliamperes in output current. This operates a standard telegraph relay, which transmits an impulse to a chronograph pen. A second pen gives a reference marking of one-second intervals controlled by the laboratory standard clock.

The chronograph is a standard four-pen Favager instrument operating with a maximum tape speed of 1 cm. per second, so that time intervals of 1/20 of a second may be read with ease.

Costs of High-Pressure Units

STEVENS & WOOD, INC., submit in the recent N.E.L.A. prime movers committee report the relative unit costs of the 400-lb. pressure station at Toronto, Ohio, and the 1,400-lb. pressure station at Deepwater, N. J. The latter, while designed for a maximum of 1,400 lb. per square inch, is nominally a 1,200-lb. pressure station.

Relative Costs of 400-Lb. and 1,400-Lb. Installations

(Stevens & Wood)

	Cost, Dollars per Kilowatt	
	Toronto 140,000 Kw. 400 Lb. Pressure	Deepwater 159,000 Kw. 1,400 Lb. Pressure
Land	$0.82	$1.57
Preparation of site	1.64	0.21
Yard work	4.42	4.48
Riverfront work	....	2.68
Foundations	15.93	4.16
Building	10.78	10.11
Piping (not including circulating water)	4.75	5.09
Boiler room equipment	23.41	31.01
Turbine room equipment	26.47	21.34
Electrical switching equipment (in station)	12.11	8.98
Service equipment	2.43	5.37
Coal handling	4.67	3.19
Step-up substation	6.68	6.62
Preliminary operation	0.74	0.50
Total	$113.85	$105.31

On the other hand, an analysis by Stone & Webster seemed to indicate an increase in cost of 1,200-lb. over 400-lb. designs.

Relative Costs of a 400-Lb. and a 1,200-Lb. Plant

(Stone & Webster)

	Per Cent of Total Station Cost	Per Cent Change for 1,200-Lb. Plant
General improvements, coal and ash handling	13.0	None
Buildings and foundations	17.5	— 5
Turbo-generators	17.5	+ 5
Boilers, furnaces and heat-absorbing accessories	20.0	+10
Fuel preparation, condensing and draft system	15.0	—15
	83.0	Balanced
Piping (up 25 per cent)	6.0	+1.5
Feed water system (up 50 per cent)	3.0	+1.5
Switching (up 20 per cent)	8.0	+1.5
Contingencies	....	+1.0
	100.0	+5.5

The Kansas City Power & Light Company estimated an increase in cost per kilowatt of $8.81 and that the B.t.u. saving per kilowatt-hour would be 2,990. A load factor of 33.8 per cent should be necessary to justify the additional investment (15 per cent) on the basis of the fuel saving (67,000 B.t.u. for 1 cent).

What the Public Has a Right to Expect

By
Hon. R. T. HIGGINS
Chairman Connecticut Public Utilities Commission

IF A merchant, camp or hotel manager, automobile concern or the like fails to ascertain periodically what his customers have a right to expect, he may sooner or later be surprised with reverses in business. With a large corporation, particularly a utility, such oversight may bring the additional embarrassment of political harassment or difficulties of financing. Therefore the frank opinions of utility commissioners on this subject should be of help in developing a permanently prosperous business, even if the facts revealed are unpleasant to hear. In this article, based on an address before the New England division of the N.E.L.A., the Commissioner of Connecticut presents his views.

UTILITIES are organized and granted certain legislative rights and privileges to supply the general public with a specific commodity or service. The nature of the commodity or service is such that duplication or competition would constitute economic waste. Wherefore, more or less exclusive, or commonly termed monopolistic rights and privileges are granted the utility. It is because of this grant that public regulation is warranted, and, because of these more or less exclusive rights, special duties and obligations rest upon the utility, which asked for and assumed the more or less exclusive right to supply the public with its commodity or service.

Fundamentally, it is the purpose and duty of the utility, first, to supply the public within its chartered territory with adequate service at reasonable rates; second, to maintain and to enlarge and improve its plant and equipment in keeping with the demand for service and in keeping with the progressive art or science in the particular industry; third, to so manage and operate its property and finances as to be able to maintain its plant and equipment on a progressive and up-to-date standard, always conducting its business on an economic basis consistent with modern progress and good service; fourth, it is the duty of a utility company, through its officers and employees, to recognize the fact that it is created by the public as its agent, with the protected privilege of supplying the public with a special service or commodity, and act accordingly. To do this requires private capital, and it should understand that the demands of the public, with which it should comply, must be just and reasonable demands under the particular conditions and under the laws governing the utility's operations.

R. T. Higgins

A refusal to comply with unreasonable public demands is no violation of its trust.

I now come to the question of what the community has a right to expect from the utility. The expression "community" must be taken in a limited sense, as to extent, because certain communities are entitled to expect specifically more than other communities less favorably located, where local conditions detrimentally reflect upon the cost or unit prices of the commodity served. There are, however, certain fundamental principles which are sufficiently broad to be considered as having general application. These may be summarized in four groups and stated for guidance as follows:

First—The community has a right to expect adequate service at reasonable rates; the degree of adequate service and reasonable rates depending upon the immediate or local conditions, as adequate service and reasonable rates for a rural or thinly populated community might be wholly inadequate and unreasonable for a populous district. It is a recognized economic principle that mass production reduces the unit costs of the commodity produced. The community is entitled in all cases to receive that high degree of adequate service which it is reasonably possible for the utility to render under all existing local conditions, at the lowest reasonable rate consistent with wise economic management and sound financing.

Second—The community is entitled to expect that officers and management of a utility will study and ascertain the present and prospective needs of the community in the particular line which it has undertaken and agreed to serve, and exercise every reasonable means to supply those needs, and be reasonably prepared to meet anticipated requirements in the future.

Third—The community is entitled to expect that the officers and directors of a utility, whose duty it is to be familiar with the particular industry engaged in and its development, shall adopt increased efficiency and economy, and improved modern methods and appliances, in keeping with the scientific development and

improvements in all the arts pertaining to the particular utility. The unorganized community or public should not be required to go into research work to reveal defects, if any, in management and operation. The utility itself should discover and correct them.

Fourth—The community is entitled to expect and receive at all times from the officers and employees of the utility uniform courtesy. Courtesy costs the company nothing, but is a most valuable and necessary asset in dealing with its patrons. Lack of courtesy creates lack of public confidence. A public utility is a community industry, in which a spirit of honest co-operation should exist. With such a spirit of co-operation, the community is entitled to expect and receive such special or general information pertaining to the company's business as is or may be of legitimate public interest. I am a firm believer that any utility should convey to the public all legitimate and honest information. Misinformation creates antagonism and silence is destructive.

The community, however, is not justly entitled to expect that the utility should render adequate service, or any service, at a rate so low that the company is unable to meet its operating expenses, fixed charges and pay a minimum reasonable return on the investment. Neither is a part of the community entitled to expect service at so low a rate that it creates a continued loss which must be borne by other parts of the community. This creates discrimination, and it creates an intercommunity subsidy whereby certain patrons are paying for the benefit of, or losses caused by, other patrons. I use the expression "continued loss" because a temporary loss in certain cases may well be borne by the utility in anticipation of future development.

In brief, the community is entitled to expect that the utility will conduct its business on a progressive but sound economic policy, for the benefit of the public, and render to its patrons that degree of adequate service and reasonable rates which such management and policy will permit, after allowing a fair return on the properly depreciated value of the property used and useful in the rendition of service.

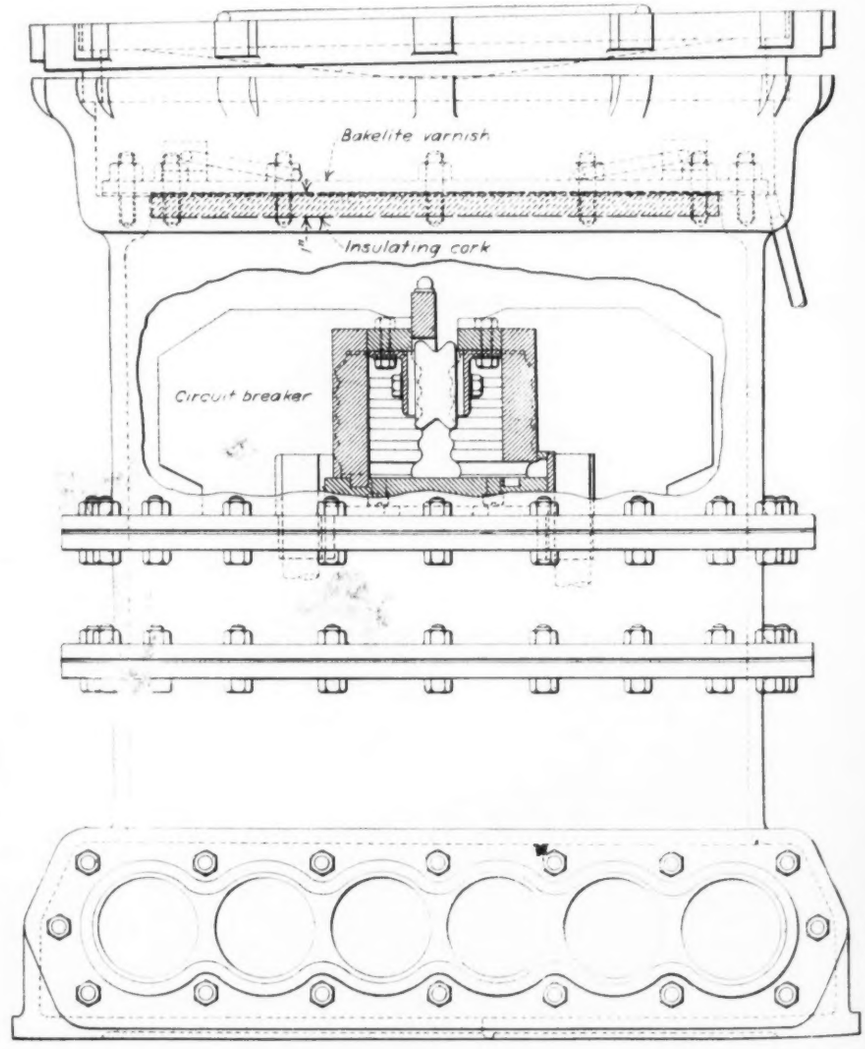
No utility should be exploited for private gain. The public right and the public interest are paramount, and if private ownership, which I firmly believe in, is to continue, it must be subject to the general public welfare. If we ever have government ownership of public utilities in this country it will be brought about by the utilities themselves combining and operating for unreasonable private gain and against general public welfare. Individual groups may at times be unreasonable, but the combined public sentiment of a nation is bound to be in keeping with its moral standards and represents a force that must and will be recognized.

Prevention of Condensation in Junction Boxes

By Harry G. Hall
Assistant Superintendent of Underground Lines
Detroit Edison Company, Detroit, Mich.

Condensation of water on the inside of the lids of junction boxes of direct-current systems and its dropping down on the automatic switches often housed in them is a frequent source of operating trouble. Expedients of various kinds are in use to protect such switches, the commonest being a waterproof cover over the switch. But if this cover be of metal it may itself collect condensate and its effect be merely to mitigate to some degree, rather than entirely to remove, the difficulty. A loose-fitting bakelite sheet supported over the switches in an umbrella effect corrects this condition and is sometimes used. However, expedients are only corrective, not curative, as the true solution of a problem must be. In the particular instance a cure apparently has been found and is in use on the system of the Detroit Edison Company.

The condensation, obviously, was caused by the fact that the inner lid of the box was at a lower temperature than the air inside it. It followed logically that the condensation could be prevented by removing the lid from



Layer of Cork Inside Junction Box Lid Prevents Condensation of Water

contact with the air. This was done by cementing a layer of insulating cork on the inside of the lid. This layer is 1 in. thick and is held to the lid by an application of bakelite varnish. Trouble from water dripping down on switches housed in junction boxes so equipped has entirely disappeared.

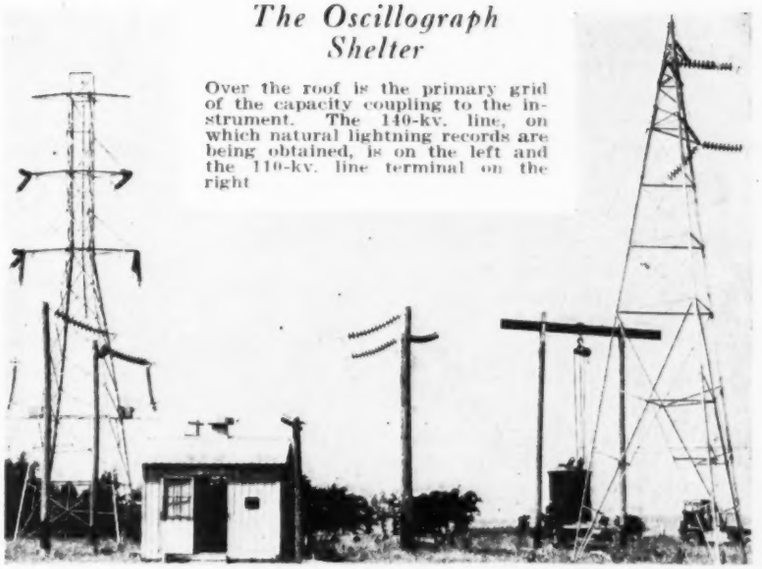
Field Study of Lightning Begins in Michigan

THE new portable 1,000,000-volt generator developed at the Pittsfield plant of the General Electric Company has been set up at one end of a 110,000-volt line, extending 45 miles from Croton to Grand Rapids, released by the Consumers Power Company for surge and lightning studies. The outfit, mounted on a trailer, comprises a 110-volt step-up transformer and eighty 25,000-volt condensers arranged in two groups of 40 in series. The bank will give about one discharge per minute.

The Consumers Power Company is also collaborating with Purdue University in a study of the effects of natural lightning on transmission systems and electrical equipment. Two records of natural lightning have already been obtained by means of the hot-cathode oscillograph, developed by R. H. George, Purdue research associate. The oscillograph is connected to a 140,000-volt line close to the site of the lightning generator and taps from both lines are brought to one oscillograph so that records of both natural lightning and artificial lightning are made on the one instrument. Sphere gaps are installed along the 110,000-volt line to determine the attenuation of the surge, and an automatic surge recorder is also in service.

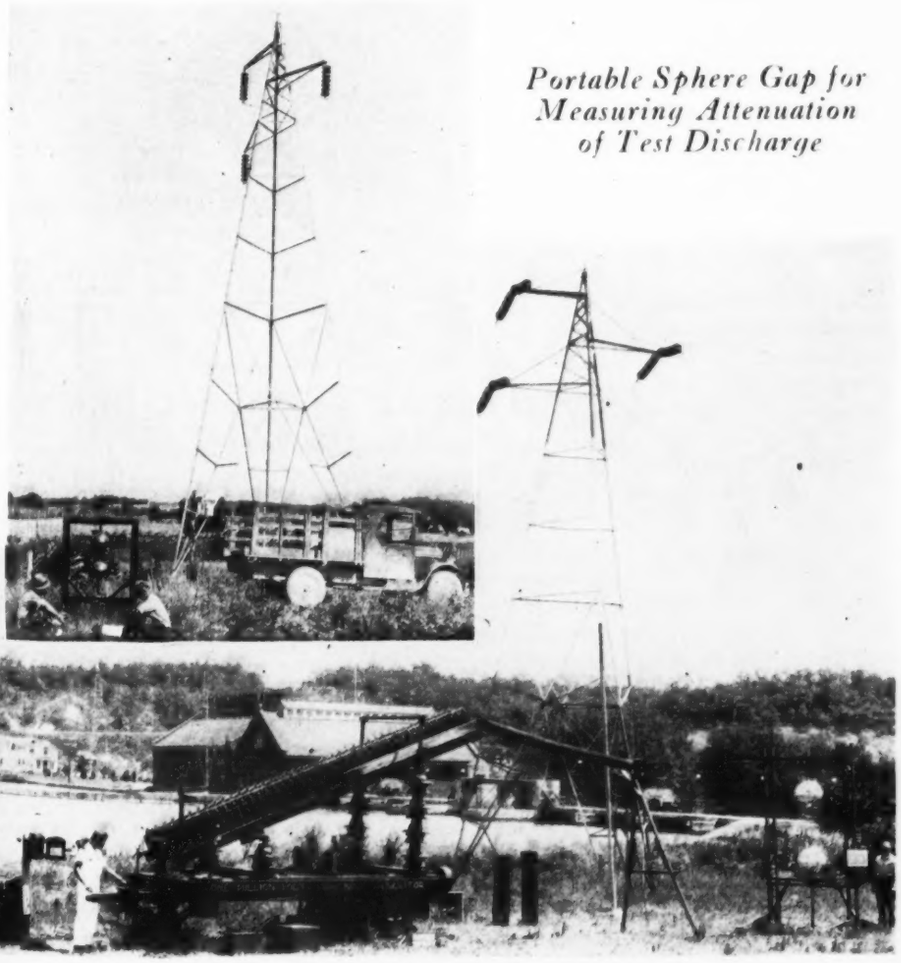
In one series of tests 400,000-volt surges were repeatedly impressed on the middle of the three line wires. The sphere-gap readings along the line showed that the voltage dropped because of corona and copper loss from 400,000 volts at the source to half that value 7 miles away and to only 50,000 volts at a distance of 35 miles. At the same time the surge induced a voltage in the two other wires of from 100,000 to 140,000 volts at the source down to 50,000 volts at 35 miles.

The study will also embrace a fresh determination of corona coefficients, the effect of induced lightning discharges, the efficacy of grounding and other means of lightning protection, and the circumstances attendant on the "test to destruction" of a 10,000-kva. transformer bank.



The Oscillograph Shelter

Over the roof is the primary grid of the capacity coupling to the instrument. The 140-kv. line, on which natural lightning records are being obtained, is on the left and the 110-kv. line terminal on the right



Portable Sphere Gap for Measuring Attenuation of Test Discharge

Test Set Installed at Croton, Dam and Power Station in Background

Constructive Leadership vs. the Horrible Example

By C. R. Beardsley
Chairman N.E.L.A. Accident Prevention Committee

MANY people can recall cases of street beggars whose success depends on some apparently frightful contortion of limbs or features. One "blind man" was recently under our observation. Added to his "blindness" was an agonized expression and a drawing back of the head so that his "sightless" eyes were directed upward. Many, of kind but unwise impulse, were so impressed as to give freely. Not so other people who observed that on alternate days the contortion and expression of the same beggar were of quite another nature. To distinguish the genuine from the impostor is difficult.

Somewhat in the same class is that attempt to attract attention and impress the worker, by means of illustration or written description of the horrible agony of the injured man, in the immediate act of being injured.

A consideration of the psychology of impressing safe methods and habit is well worth the effort of any director of a group of employees whom he wishes to lead toward safety. It would seem quite obvious that a reasonably intelligent, literate group of construction men, operators, mechanics or office men can be reached by logic, appeal to reason or to responsibility; in other words, to their higher natures. Intelligent leadership can get results through intimate knowledge of the work in hand and a proper presentation of safe practices.

To find it necessary to appeal to fear of injury by the illustration of agony in an accident is an admission of lack of ability to use methods of skilled and able direction. Appeal to a man's sense of responsibility to his fellow employee and his own family is a far finer incentive and better psychology than to cudgel him with a fear of personal injury and pain.

The scarehead method is reminiscent of the slum rescue missions, in which some derelict is persuaded to describe or exhibit his misery so that others will be scared into avoiding his mistakes. Doubtless much good has been accomplished among the very unfortunate and unintelligent by these methods. It must be recognized, however, that such methods are more necessary to reach unfortunate specimens of deficient manhood.

If there are among utility employee groups a few so unintelligent that they can be impressed and aroused to accident prevention enthusiasm only by dragging out the *corpus delicti* or its equivalent in picture or description, they are not of the right caliber to stay. They are without doubt of the class which causes accident by its own sodden dumbness and should not remain in any position where they can contribute to accidents.

Utility employees are mostly keen, self-respecting, intelligent and reasonable. This applies, in the writer's estimation, to the great majority even among the laboring classes. Given a foreman of human understanding who can make himself understood in language which his men speak, then a leadership of right quality should be achieved. No matter what the character of work being done, and no matter what efficiency, speed or other excellence of performance he may achieve, no foreman is a good foreman who does not inspire his men with a desire to protect from injury not alone themselves, but especially their fellow employees.

The cynical, supercilious foreman who sometimes believes he knows his job so well that he will not listen to suggestions for safety is generally the man in whose group accidents are frequent and often severe. A good foreman can be spotted often by the good housekeeping and good safety record of his group. Orderly process and skillful handling of the job are generally the underlying qualities of foremanship which result in clean quarters and low accident record.

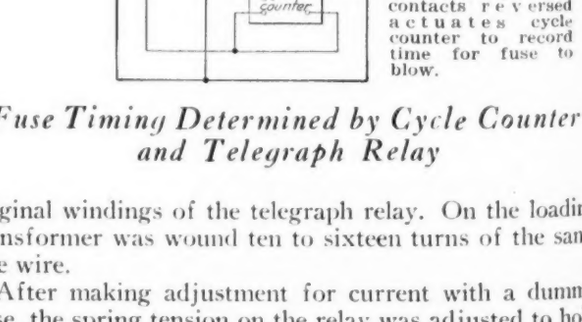
Safety leadership can never succeed when it must rely on pointing out a danger without a constructive suggestion for its avoidance.

The approach to group "safety consciousness," therefore, lies in the inspiration of leadership which points out and continually emphasizes the right method of action. Such leadership is more difficult, requires more knowledge of the job and of the human beings directed. Being more difficult, it is rarer, more to be sought and should be accordingly rewarded when found.

Checking Time of Operation of Expulsion Fuses

By W. Jordan
Superintendent Electric Meter and Test Department, Westchester Lighting Company, Mount Vernon, N. Y.

RECENTLY tests called for a determination of the time for line fuses of the expulsion type to open at various overloads. Due to the low voltage used in the fuse circuit it was not possible to use the cycle counter without some kind of a relay. We had on hand a telegraph relay which we used as a circuit-opening device. About sixteen turns of No. 20 wire was wound over the



A rewound telegraph relay with contacts reversed actuates cycle counter to record time for fuse to blow.

Fuse Timing Determined by Cycle Counter and Telegraph Relay

original windings of the telegraph relay. On the loading transformer was wound ten to sixteen turns of the same size wire.

After making adjustment for current with a dummy fuse, the spring tension on the relay was adjusted to hold the contacts closed. The main switch was opened and the fuse to be tested was installed in the cut-out box. The cycle counter was set at zero and then the main switch was closed. Due to the fact that the circuit including the fuse was of quite low resistance there was very little voltage induced in the relay circuit. At the instant of fuse blowing the relay circuit had full voltage induced in it and operated the relay opening circuit to cycle counter.

There are other methods which could have been used, such as a current transformer in the fuse circuit to operate a relay, but the above-mentioned scheme worked very well.

Selling Industrial Heating

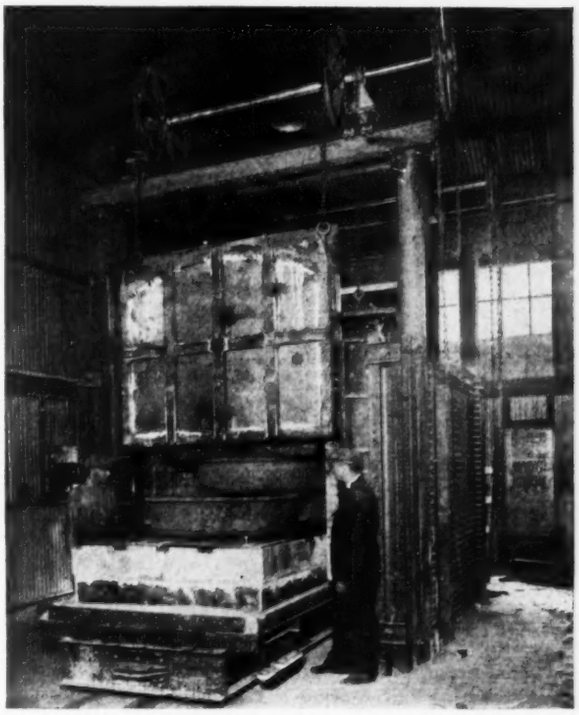
Survey forms basis of sales campaign. Personal solicitation secures prospects. Advertising and continuous follow-up are keys to success

By G. N. HAWLEY
Industrial Heating Engineer
Southern California Edison Company, Los Angeles, Calif.

CENTRAL stations preparing to exploit the industrial heating field actively will wish to collect as much information as possible in regard to methods found successful by other companies in carrying on similar work. For this reason it is believed that the experience of the Southern California Edison Company will be both timely and of value to such utility companies and to the electric-heating equipment manufacturers who are co-operating to electrify the heating processes of industry.

Much has been written and said about the lack of appreciation on the part of power companies of the excellent revenue-producing possibilities of the electric-heating load. In a large measure this criticism is justified, but there are some excellent reasons why utility companies have been slow to realize the attractiveness of the heating load. Chief among these is the fact that central stations the country over are being beseiged by manufacturers of every conceivable type of energy-consuming device, asking that the utility take over the burden of sale and distribution of such devices for the sake of the power load involved. Where the energy consumption of the device is sufficient to warrant some activity on the part of the central station such requests may be justified. No one questions the desirability of such loads as electric refrigerators, ranges, water heaters, ironers, etc., but central stations are being requested to promote the sale of devices which consume as little as 50 cents' worth of energy in a year. The central-station executive has had to assume a passive attitude toward most of the requests and it is not surprising that he has been prone to overlook the possibilities of industrial heating, or to put it in the same class with other loads of a doubtful nature. It is only recently that the excellent revenue-producing possibilities of the industrial heating load have been forcefully called to the attention of central-station men by means of actual data taken from a large number of installations over a sufficient period to be conclusive.

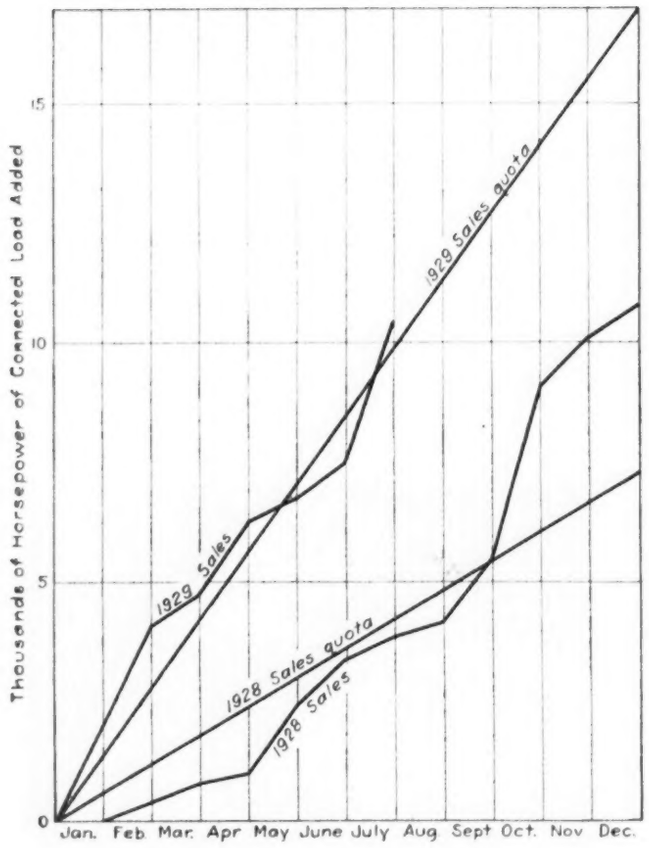
Statistics have now been prepared to show that the revenue from a kilowatt of connected industrial heating load exceeds practically all other forms of load and, furthermore, that the plant investment required to serve this load is less than any other power load, due to high power factor. Although there is already a considerable amount of industrial heating load on the lines of central stations, such load has usually been considered simply as "power" load without segregating it from other types of power loads. In this way the advantages of the heating load have not become apparent to the utilities. If each central station would make a load check and determine the amount of industrial heating load already on its lines and the consumption of energy due to such load the merits of the heating load would become apparent at once and the executives of these central stations would be convinced of the advisability of promoting industrial heating. In the final analysis, central-station companies are primarily manufacturers and distributors of electrical energy. The actual revenue derived from any form of load should be the criterion of the attractiveness of that load.



One of Many Heat-Treating Furnaces Sold Through Efforts of Utility Heating Specialists

PRELIMINARY SURVEY

One of the first steps taken by the Edison company in developing the industrial heating load was a complete survey of industrial plants served. Three men were detailed to carry out this survey and each was allotted a portion of the territory in which to carry out his survey work. Practically every industrial plant was canvassed by these men and a report was made showing the present



Striking Results of Active Industrial Heating Sales Effort

use of electrical energy, the operations being done electrically, the operations being done with competitive power or fuel, the condition of the electrical equipment in the plant, the adequacy of the lighting equipment, etc. A report was made for each plant on a separate numbered sheet, similar to the one shown herewith, and the estimated possibilities for increased load noted thereon. These sheets were then mimeographed and copies made for the general office file, district office file, district power salesman and industrial heating specialist. This work was carried on from August to December, 1927, a total of 1,165 industrial plants being inspected and reported upon. Although the survey was intended to cover all applications of electricity to industry, the majority of non-electrified load was found to be heating applications. Only in rare cases were plants found to be using competitive power devices in place of motors where the use of motors was practicable.

The immediately available potential heating load indicated by this survey was 58,200 hp., after making all deductions for processes where the economy was doubtful. In addition, a deferred load of some 100,000 hp. was indicated by the survey. An existing load of 19,200 hp. in heating equipment was found to be already on the lines, consisting mainly of arc furnaces for steel melting, and was consuming 27,637,734 kw.-hr. annually. From a study of the survey a quota of 7,250 hp. for new industrial heating business was set for 1928.

Organizing the Sales Force

After finding that the majority of non-electrified applications in the territory consisted of heating, the next step was the formation of an industrial heating sales force to develop this business. The organization of the sales force was conducted as nearly as possible along the lines suggested in the National Electric Light Association bulletin entitled "A Sales Plan for Developing the Industrial Heating Load for Electric Service Companies." Three industrial heating specialists were employed on straight salaries and given the responsibility of developing a heating load that would remain sold. Some of these men were recruited from the company's own power sales organization and others from the industrial heating divisions of the large electrical manufacturers. A fourth specialist has since been added to the staff. To date three of these men have attended the industrial heating schools conducted by the N.E.L.A. in the East, and it is planned to have at least one man attend each year in order to keep the staff entirely up to date on this rapidly advancing electrical application.

The heating sales force was impressed, first of all, with the necessity of soliciting only that business which could be depended upon to prove highly satisfactory to the customer and the company alike. Doubtful applications were not to be encouraged. In particular, it was desired that the equipment which the customer bought be of good design and backed by a reputable manufacturer, so that failure of heating equipment would not be responsible for a setback in the development of the heating load.

The industrial survey sheets were divided between the heating specialists according to territory. Each sheet was scanned for heating load and the various applications were classified as to whether they were immediately available, deferred or entirely out of the question. Customers who were revealed by the survey to be immediate prospects were called upon as fast as the specialists could establish contacts. The application was thoroughly studied and the fact that electrical equipment was available for that particular process was brought to the attention of the plant manager and shop men alike. These men were told of the numbers of other plants using electric heat for the same or similar processes and the advantages

Forms Similar to This Were Used in Making an Industrial Heating Survey in 1,165 Plants

The notation at the bottom indicates sale of equipment resulting from salesman's follow-up.

SOUTHERN CALIFORNIA EDISON COMPANY
EDISON BUILDING
Los Angeles, California

Report No. 4
Dated in field 2/8/28

Industrial Classification, Machine Shop. District, Whittier.
Name, H. C. Smith. Permission from R. R. Crum. By Bowler.
Plant Address 111 So. Milton. Telephone, 417237.
Office Address.....Officers, H. C. Smith and R. R. Crum
Chief Engineer.....Electrician .....
Kind of Business, Machine Shop, Oil Well Tool Manufacturing.
Connected load, Total 301 Hp. Heating, 27 kw. Welding, 40 kw.
Electric Equipment in Use Consists of:
All machinery is electric drive, about half on line shafting.
1 Electric salt bath, tempering furnace, 27 kw.
5 300-amp. arc welders.
1 450-amp. arc welder.
Control equipment not entirely modern, lighting is poor.
Non-electrified Equipment and Operations as follows:
1 Heat-treating furnace, gas fired, 30-in.x20-in.x60-in.
2 Oxyacetylene welders used for cutting.
5 Small hand cranes.
Remarks: This plant is very busy at the present time, contrary to the situation of the other oil tool manufacturers. At the present time they are very crowded and the plant is in an old building. They expect to build and move into a new building in a short time. An electric furnace has been installed for about one month and they are quite satisfied with the exact degree of control which they obtain in their work. The quality of their product is more important than the operating cost.
Estimated Non-electrified 40 kw. INSPECTOR C. L. ASHLEY.
Sold 100 kw. box furnace 36-in.x72-in. Oct., 1928
Sold 100 kw. box furnace 36-in.x80-in. Mar., 1929
Sold 200 hp. arc-welding equipment Mar., 1929

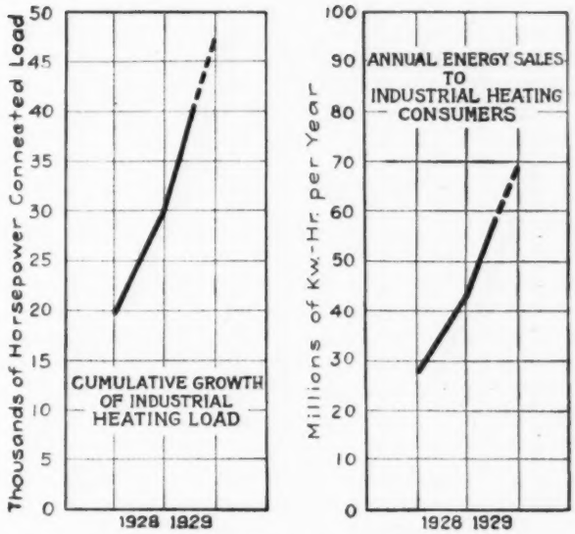
which had been found were pointed out. In case there were similar electrical applications in the company's own territory, the customer was taken on an inspection tour and given an opportunity to see the equipment in operation and to talk with the user and find out how he liked it. This was found to be one of the most convincing arguments for electric heat and is practiced whenever it is possible to locate a plant with the proper electrical equipment. As fast as prospects for heating equipment were developed, representatives of the electrical manufacturers were called in to recommend and quote on the proper equipment for doing the job.

Co-operation with Manufacturers

Considerable care must be exercised to avoid difficulties where more than one manufacturer is quoting on the same job. Even then it is impossible to avoid criticism entirely from one or another of the manufacturers. This company adopted the following general policy of co-operation: Where a prospect is discovered by one or the other of the manufacturers and referred to the power company, the company endeavors to co-operate entirely with that manufacturer until either the equipment is sold or other manufacturers come upon the job independently.

In the latter case, providing the equipment offered by the other manufacturer meets with the power company's approval, an unbiased stand is taken, the company's chief concern being to keep the customer sold on electric heat. Where the power company is responsible for locating a prospect, such a prospect is turned over to all manufacturers in a position to supply proper equipment and to assist in closing the sale. Hard feelings result only when another manufacturer comes upon a job independently at the time the company's salesman is working with a competitor. The manufacturer with whom the company is co-operating at the time is prone to believe that the company has encouraged his competitor to come into the picture. However, in the main, this policy has worked out very satisfactorily, both to the power company and the electrical manufacturers.

The major part of this development program is in the nature of direct customer contact. This is the surest and swiftest method of producing results, although it is more expensive than other methods. Industrial heating is a very highly competitive field and the best means of development is to keep everlastingly after the customers who are good prospects. In the final analysis, the amount



Rate at Which Industrial Heating Load Is Being Added

of business obtained will be in proportion to the number of calls made. Electric-heating equipment is generally more expensive than fuel-fired equipment and it takes a considerable number of calls on each customer to convince him that the advantages of electric heat outweigh the increased cost of the equipment.

Contrary to general opinion, the cost of electrical energy versus the cost of fuel has not been found to be the important feature in the sale of the electrical equipment. In the instances which will be cited in subsequent articles to show the method which was pursued in placing a number of heating applications on the Edison company's lines it will be seen that the cost of power, so long as it is somewhere within reason, has been placed decidedly in the background. The customer will generally admit at once that electric heat has some very decided advantages over heating with fuel. It is the function of the heating specialist to convince such a customer that these advantages are sufficiently important to outweigh, by far, any possible difference in the cost of electricity as against fuel. It is not meant to imply that relative fuel costs should be entirely disregarded in the search for heating load, for a little figuring will convince any one that certain crude processes could not possibly be made electric

Industrial Heating Display Which Developed Many Prospects at Western Metals Congress

applications with any satisfaction, due to the cost. It is the duty of the heating specialist to determine by preliminary analysis whether it is possible to do the job at all with electric heat and at a reasonable cost and, if it is, to go ahead and sell the idea of using electric heat without regard to the cost of competitive fuels.

Advertising Important

Although direct customer contact is relied upon for obtaining most of the business, it has been found advisable to use direct-mail literature, trade paper advertising and various other means of telling the electric heating story. One of the outstanding sales helps is considered to be the N.E.L.A. motion picture entitled "Electric Heat in Industry." Several showings of this film have been made before local technical societies, industrial groups and colleges. At an early date it was discovered that one of the most fertile fields was in plants devoted to the manufacture of supplies and tools for the petroleum industry. Space in several petroleum journals was therefore engaged, and as fast as electric heating installations were made in oil tool plants advertisements were run calling attention to the prominence of the user and showing a photograph of the installation. Two ends were served by this: The customer was given recognition for the use of a modern process and the desire for electrically heat-treated material was created in the minds of the men who had to use such material.

At present the company is engaged in the preparation of direct-mail literature to be distributed to all consumers, calling attention to the wide variety of electric heating applications and urging them to request advice and assistance whenever they have heating problems to solve.

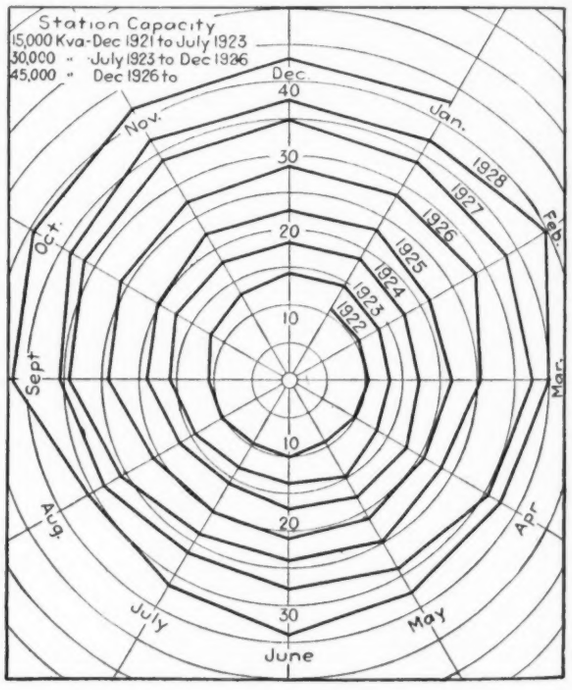
A great deal of excellent contact work was done through the local chapter of the American Society for Steel Treating. Practically all of the heat treaters in the vicinity of Los Angeles belong to the society and it was possible to gain their confidence and attention through participation at the local meetings. In fact, some of the most valuable contacts were made at these meetings, inasmuch as it was much easier to focus the prospective user's attention on the subject here than at the shop, where he was continually being distracted by the demands of his own job. By co-operating with the entertainment committee of the chapter, one of the meetings was devoted entirely to the subject of electric heat. At this meeting the five-reel motion picture "Electric Heat in Industry" was exhibited and several short talks were made by members of the Edison company and the General Electric Company. This one meeting was responsible, as was found later, for the installation of several furnaces and implanted the seed which has and will develop into considerable heating load.

At the recent Western Metals Congress, held in Los Angeles in January, 1929, the Southern California Edison Company rented a large booth and put in an exhibit of local products electrically heat treated. A specimen of the product was exhibited on a shelf or stand in the booth and, directly behind it, a photograph of the electric furnace or oven used in the process. A slogan was adopted, "Electric Heat Helps to Make These Products Better," and cards bearing this slogan were freely used in the booth. Many of the firms whose products were exhibited also were exhibitors at the exposition and permission was obtained to place some of these slogan cards in their booths and thus tie in with the user of the equipment. The exhibit in the company's booth, with the prominent display of the user's name, gave him additional advertising help and further cemented friendly relations.

What may be accomplished by an intensive drive as outlined above is shown by the fact that during 1928 10,800 hp. of new industrial heating business was secured, having an estimated consumption of 16,120,000 kw.-hr. annually and a revenue of $210,000. This brought the total connected industrial heating load on the Edison system up to approximately 30,000 hp., from which the estimated annual revenue is $570,000. Based upon results for 1928 a quota of 17,000 hp. of new industrial heating business was set for 1929, and as will be seen from the accompanying curves this quota is being exceeded. By the end of this year it is expected that the total heating load will have reached 47,000 hp., consuming 69,000,000 kw.-hr. and yielding a yearly revenue of $800,000.

Polar Load Chart Shows Growth at a Glance

A NOVEL method of plotting loads so that the growth may be readily observed is in use by the Hydro-Electric Power Commission of Ontario. The sample shown is for a 110,000-volt transformer station on which the growth has exceeded the average for the system. In actual practice each year is drawn in a different color, making the changes in load stand out very distinctly.



Polar Diagram Shows Load Trends at a Glance

Twenty-minute peak in thousands of kilowatts

Not only does it show the relative status at the same period each year but also the trend over a period of months is very clearly indicated.

The customary rectangular graph gives less direct interpretation of the trends because it lacks continuity. Also a lesser number of years can be represented without crowding of curves. The polar chart shown would have been good for fifteen years in the case of a station experiencing normal growth.

From Berlin to Tokio

Prominent German industrialist talks on economic relations. Stresses coming Berlin conference

THE views of an industrial leader, at the head of a manufacturing and commercial organization doing a world-wide business, are significant.

Dr. ing. e.h. Carl Koettgen is chairman of the board of managers of the Siemens-Schuckertwerke A. G., which, together with the affiliated Siemens & Halske and companies controlled by them, employs 130,000 persons. He is also president of the German Engineering Society (V.D.I.), the world's largest and, doubtless, most influential engineering society, embracing all engineering branches, and is to be chairman of the second World Power Conference in Berlin, June 16 to 25, 1930.

Dr. Carl Koettgen

In the latter capacity he is now touring the United States, in company with other German delegates to the Tokio Engineering Congress. Speaking recently in New York, at a luncheon meeting of the Board of Trade for German-American Commerce, he pointed out that the Berlin conference will by no means be of interest only to the engineering profession. The conference will emphasize the large national and international, financial and economic side of the whole power situation. He therefore hoped for a large attendance of leaders of American industry, business men and bankers, to whom he extended a cordial invitation to attend, with the assurance that they would be heartily welcomed and that everything possible would be done to make their journey interesting and worth while.

Healthy Commercial Relationship

Continuing, he commented on the healthy commercial relationship existing between his country and the United States.

The German electrical industry, he stated, reflects in two ways the economic conditions and prospects of Germany: First, it is affected by the modernization and change of organization which has become known under the name of "rationalisierung." Second, it shows the endeavor, so strongly forced on Germany, to increase exports.

He pointed out that "rationalization," or reconstruction for mass production, vitally affects the business of the electrical industry, because in nearly every instance new equipment of factories or machinery and modern means of transportation bring new orders for electrical apparatus. The rapid increase in electrical communication, telephone, telegraph and radio, constitutes another favorable factor. As to exports, between 30 and 40 per cent of the electrical manufactures are being sent abroad, and the growth of the industry during the ten years after the war has been due not only to the domestic business but to the foreign trade as well.

Dr. Koettgen stated that it had been his special endeavor during the past several years to raise the efficiency and productivity of the labor, skilled and unskilled, in the concern of which he is the head. Definite progress has been made in this direction, so that practice is now in line with that prevailing in the United States.

Subsequently, in conversation with a member of the Electrical World staff, Dr. Koettgen gave evidence of his keen interest in American industrial progress and his readiness to tell of conditions abroad.

Asked about the employment situation, Dr. Koettgen stated that there are still 600,000 persons unemployed, but that earnest efforts are being made to alleviate this bad economic condition. He conceded that it had required hard work, and lots of it, to bring the country up to its present level.

As a result of the war much of his company's investments outside of Germany were completely wiped out and the collapse of the monetary system precluded the possibility of reimbursement by the government.

220/380 Kv. Transmission

Asked about the important 220-kv. north-and-south line which is to connect the water powers in the Bavarian Alps, in the south, with the fuel fields in central Germany, Dr. Koettgen explained that this line, for which his company built the major electrical equipment, is to be used for sending energy in either direction. During the season when abundant water is available it will be utilized to deliver power into the densely populated industrial area and will thus cut down on the coal and lignite consumption.

When water is scarce it will enable south Germany to draw on the fuel-generated energy and will thus obviate the need of huge steam reserves in that portion of the country.

American engineers have expressed an interest in this project because the exceptional figure of 380 kv. has been reported in connection with it. This is the Y-connected voltage at which the line has been designed to be operated, but that may not be done until per-

mission is received from the proper authorities, as it is not in accord with present rules in effect in south Germany.

This is not Dr. Koettgen's first trip to the United States. On a previous visit, some years ago, he studied our methods of production, which study resulted in a book on "Economic America," and led to the introduction in his own country of methods modeled on those found successful here.

Notwithstanding the much less prosperous condition of Germany, it has been possible greatly to increase the use of household appliances, which are now being turned out by mass production. For instance, 150,000 vacuum cleaners are being made annually by the Siemens concern. Since the total output in the United States in 1927 was about 1,100,000, this may well be considered a good showing for what, in Germany, is virtually an innovation.

Reflection Factors for Ultra-Violet Radiation

By M. Luckiesh

National Lamp Works of General Electric Company Nela Park, Cleveland

THROUGH many years of work with ultra-violet radiation we have accumulated spectral reflection-factor measurements upon many substances. These are of interest in many special applications of radiation of short wave lengths and are becoming of more general interest in connection with ultra-violet radiation and health. It appears that lighting specialists may eventually find it necessary to be as familiar with reflection factors of materials for ultra-violet radiation as they now are with reflection factors for light or visible radiation.

One of our first observations was that white pigments differ materially in their reflection factors for ultra-violet. For example, zinc oxide reflects practically no energy between λ2,800 and λ3,200. Lithopone, tin oxide and barium sulphate are little better, for they reflect only a few per cent of this energy. In the same spectral region magnesium carbonate, aluminum oxide, kaolin, slaked lime and wall plaster have reflection factors from 40 to 70 per cent. Lead carbonate reflects 25 to 50 per cent. This leads one to expect large differences in the reflection factors of white paints, baked white enamels and vitrified porcelain enamels. In fact, we have found the reflection factors of such products to be very low. In the case of vitrified white enamels the reflection factors in the region from λ2,800 to λ3,200 are also low on account of the well-known absorption of common glass in this region.

Of the metals, aluminum and chromium are practicable materials for reflectors. Their reflection factors are as high as 60 per cent in the ultra-violet region under consideration. Antimony, silicon and cadmium rank fairly high. Aluminum paint was found to be from 40 to 50 per cent. In this case the vehicle, whether varnish or cellulose lacquer, reduces the reflection factor below that of the metal. Nickel, magnalium, magnesium steel, molybdenum, tantalum, tungsten, speculum alloy, gold and zinc rank lower, but in general reflect from 30 to 50 per cent in this region.

The reflection factors of a few other materials for radiation from λ2,800 to λ3,200 are as follows: White blotting paper, 35 to 45 per cent; pongee silk, 7 to 16; white linen, 25 to 40; bleached cotton, 50 to 70; undyed wool, 4 to 10; white Duco paint, 2 to 3; flat white paint, 2; white Akoustical paint, 15 to 25; white-lead oil-paint, 18 to 37.

Usually the reflection factor is of lower value for λ2,800 than for λ3,200.

Recommend Service Charge

Commissioners maintain that all patrons of utilities should participate in the primary costs of rendering service

IT IS doubtful whether any feature of the regulation of public utilities has given more concern to the commissions and is less understood by the public than the fixing of a reasonable charge to the domestic consumer in order to cover the cost of distribution, accounting, reading and servicing of meters and such other costs as can be clearly separated from a commodity charge, *per se*. These costs, of course, will vary somewhat throughout the country and it, therefore, appears impossible to set up any fixed amount as the standard of a customer or service charge, whether this charge be set up separately or disguised by the use of a minimum and a comparatively high rate for the first few units of the commodity.

While by no means attempting to minimize the necessity and value of commission regulation on power rates for the large consumer and establishment of reasonable rates for the domestic consumer of gas and water, the committee on public utility rates of the National Association of Railroad and Utilities Commissioners devoted the major portion of its annual report to a discussion of the reasonableness of a customer or service charge for domestic consumers of electrical energy.

The committee recommends that consideration be given to the establishment of a service charge not in excess of $1 per month for each consumer; that the energy charge be in addition to the service charge and be reduced sharply below the average rate now in effect for domestic service; that the energy charge be divided into not less than two steps and not more than three steps; that the number of kilowatt-hours assigned to the first step of the rate for energy be considered in connection with the service charge and in connection with the monthly minimum consumers among the domestic patrons, and that the service charge be included in the energy charge for the first step in the rate schedule.

Increased Energy Use Encouraged

The monthly minimum consumer will pay his proportion of the primary cost of serving all consumers in paying the service charge monthly; therefore, his rate for energy should be low, although he be one of the many monthly minimum consumers.

Such application of the service charge will make available to a great majority of the domestic consumers the use of the many facilities available to the homes and useful in the home to save labor and add to the convenience and comfort of the family. Most common among these facilities are the electric iron, the electric washer, the electric heater for occasional use, the electric cooker or range, etc. The use of these facilities increases greatly the consumption of electrical energy.

The principal business of an electric utility is to sell

energy. It is the experience of the utilities that the forms of rates suggested above have resulted in great increases in the consumption of energy; therefore, this form of rate is beneficial and agreeable both to the domestic consumer and the utility.

Rural Conditions Require Special Action

It is not desirable that the service charge be made the monthly minimum charge for domestic consumers in rural territory at this time, although it should be made applicable to them, plus an additional sum for a monthly minimum charge, plus an additional charge for energy consumed. While much progress has been made in the extension of service in rural communities and in the adjustment of rates for that service to said communities, yet this progress has not reached the point where such definite recommendation can be made with safety as can be made for charges applicable to cities and towns.

The committee believes that the amount of the monthly service charge must vary somewhat on account of varying conditions attending the rendition of service in different territories; that the service charge should be included in the energy charge provided for the first step of the rate schedule, and that the first step in the schedule should be as small, measured in kilowatt-hours, as may be found just to the utility; that the rate for energy after the first step should be as low as profit to the utility will permit in order that the use of electric energy may be made available to the domestic consumer at a fair rate.

Control for Sidewalk Lifts

By G. H. Dewey
General Electric Company, Buffalo, N. Y.

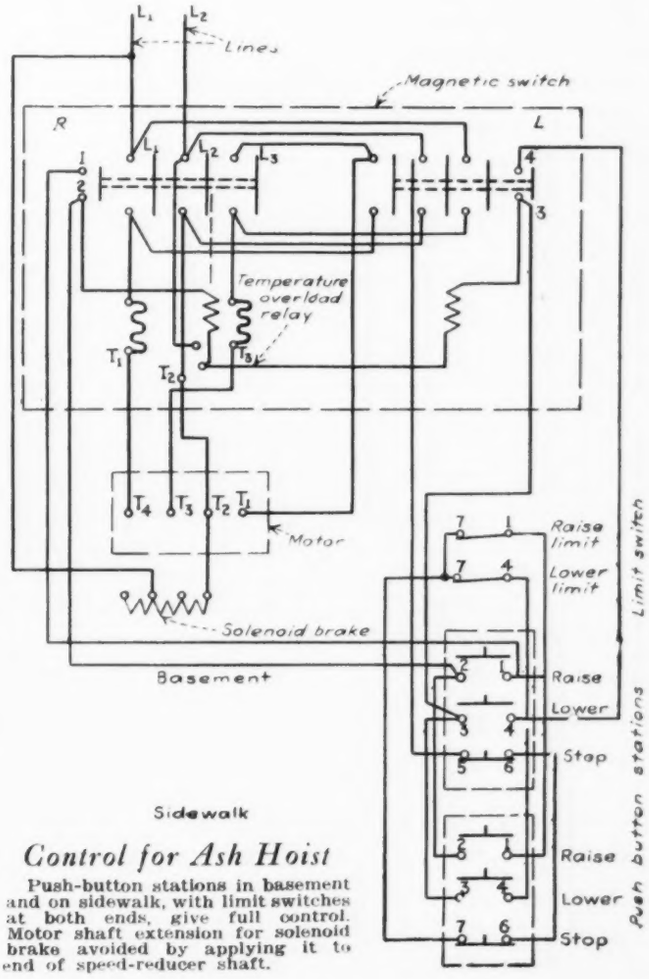
THE versatility of standard control devices is illustrated by their application to the ash hoists and sidewalk lifts manufactured by the Charles K. Ernst Company of Buffalo. The ash hoists are platform lifts installed in basements for raising ashes from the basement to the sidewalk, the lifting platform being flush with the basement floor at the lower extremity of travel and flush with the sidewalk at the upper limit. The lift, on raising, mechanically and automatically opens outward-moving trapdoors in the sidewalk and at the same time sounds a warning bell.

The lifts have a capacity of from 500 to 1,000 lb. with a speed of from 20 to 60 ft. per minute, varying with individual installations. The height of rise is also variable, depending on the installation. The drive is a standard squirrel-cage motor, rated 2 or 3 hp., 60 cycles, 1,800 r.p.m., or 25 cycles, 1,500 r.p.m. Where single phase only is available a reversible motor of that type is used.

Full-automatic reversing control with automatic stop at both levels is required and this is obtained by using a magnetic reversing switch, two "Raise-Lower-Stop" push-button stations, a solenoid brake and a geared limit switch, all standard equipment. This control permits starting the lift by a momentary contact of either the "Raise" or "Lower" button on either station, one being mounted at the basement level and the other at the sidewalk.

The limit switch is connected on the low speed side of the gear reduction, forming part of the hoist mechanism, and stops the lift automatically at either sidewalk or basement level. This limit switch has to function within close limits, as overtravel would cause mechanical injury to the hoist and undertravel would not bring the platform flush with the basement floor or sidewalk.

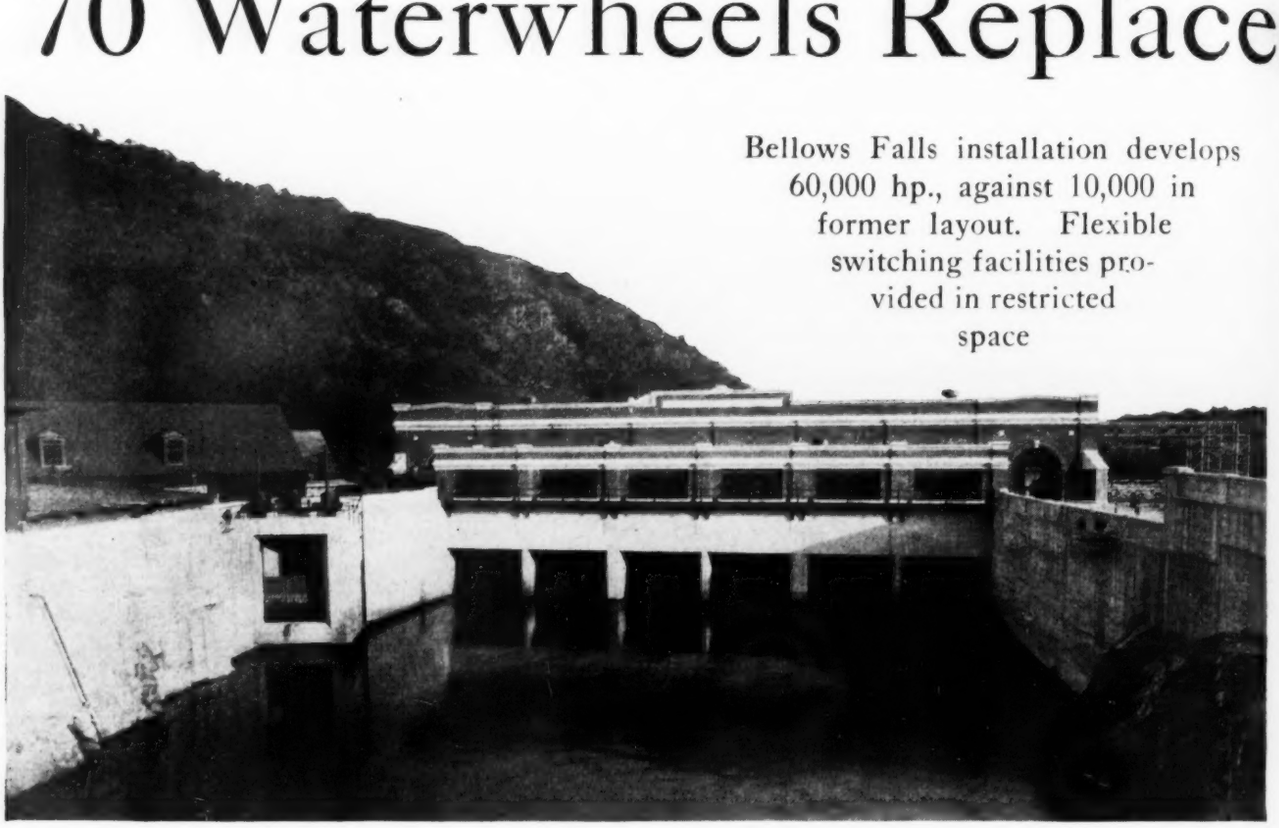
The solenoid brake is mounted on the motor end of the speed-reducer shaft, which permits the use of a standard motor with no special shaft extension. This would not be the case with a motor-mounted brake.



Control for Ash Hoist

Push-button stations in basement and on sidewalk, with limit switches at both ends, give full control. Motor shaft extension for solenoid brake avoided by applying it to end of speed-reducer shaft.

70 Waterwheels Replaced by



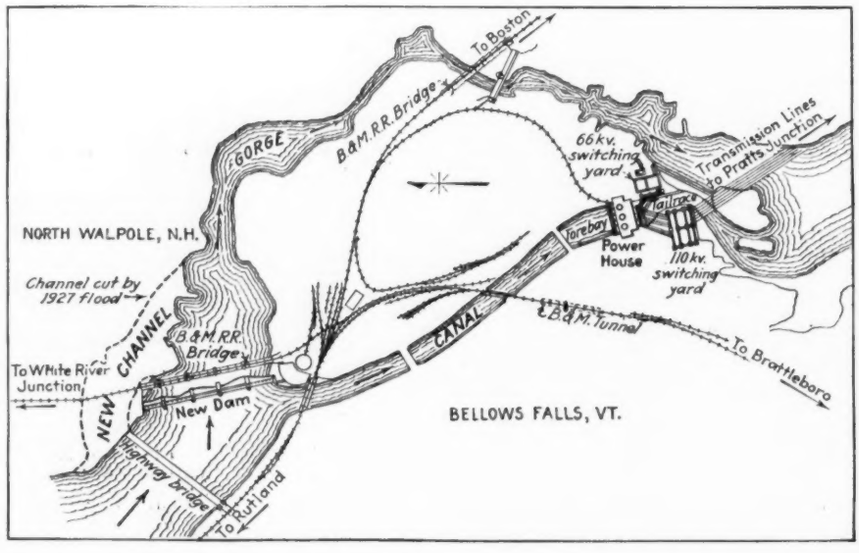
Bellows Falls installation develops 60,000 hp., against 10,000 in former layout. Flexible switching facilities provided in restricted space

AT BELLOWS FALLS, VT., the New England Power Association has lately placed in operation a 60,000-hp. hydro-electric development furnishing an excellent example of the capacity of modern engineering to simplify a complex and inefficient power-producing inheritance and to multiply the productive output of a water privilege many-fold by the use of present-day equipment. Formerly 70 wheels aggregating 10,000 hp. were at work within a stretch of about one-third of a mile. About three years ago the problem of redeveloping the project as a whole was taken up by the New England Power Company, with the result that three vertical generating units of 17,000 kva. rating each and a new dam and rebuilt canal have superseded the antiquated layout handed down from the past.

The development in general consists of a concrete dam with flood control equipment, canal, power house, tailrace and outdoor switching stations. Water conditions were favorable for utilizing a 60-ft. head, transforming the power of the falls at one point with a greatly increased over-all efficiency of development.

The dam is 620 ft. long and 18 ft. in average height. It is equipped with two roller floodgates (MAN type) and three bays of flashboards. Each gate consists of a steel plate cylinder 13 ft. 5½ in. in diameter and 121 ft. long. To this cylinder is riveted a steel plate apron, at the bottom of which is a wood sealing strip which makes contact with a steel H-beam set in the dam. The end seals of the gate are made by wood strips bearing on steel plates set in the face of the abutting piers.

Annular gears at each end of the cylinder mesh with rack gears set on an incline in the concrete piers. The gate is operated by means of a gear hoist and chain. One hoisting connection suffices as the ends of the cylinder are confined in slots in the piers and the design is sufficiently heavy to withstand the torsional moment exerted by the pull of the chain. As the cylinder rises, it rolls



Plan of Bellows Falls Development

ey Three Modern Units

By
C. E. ANDERSON
Assistant Mechanical Engineer
and
S. W. STODDARD
Assistant Electrical Engineer
New England Power Construction Company, Boston, Mass.

Roller Gate During Construction

up on the rack gears, allowing the water to pass under the gate. With the roller gate in the upper position, a clear waterway 115 ft. long by 25 ft. high is obtained. The gate hoist drive is a 22-hp. motor, through worm and pinion gears and a chain sprocket, giving a gate rise of 6 in. per minute.

The flashboards are carried to an elevation 13 ft. above the dam. They are supported by steel I-beams, spaced 6 ft. 3 inches on centers, the bottoms of the I-beams being held in steel sockets set in the dam. The upper ends of the I-beams are carried in guides on the flashboard bridge which spans the river parallel to the dam.

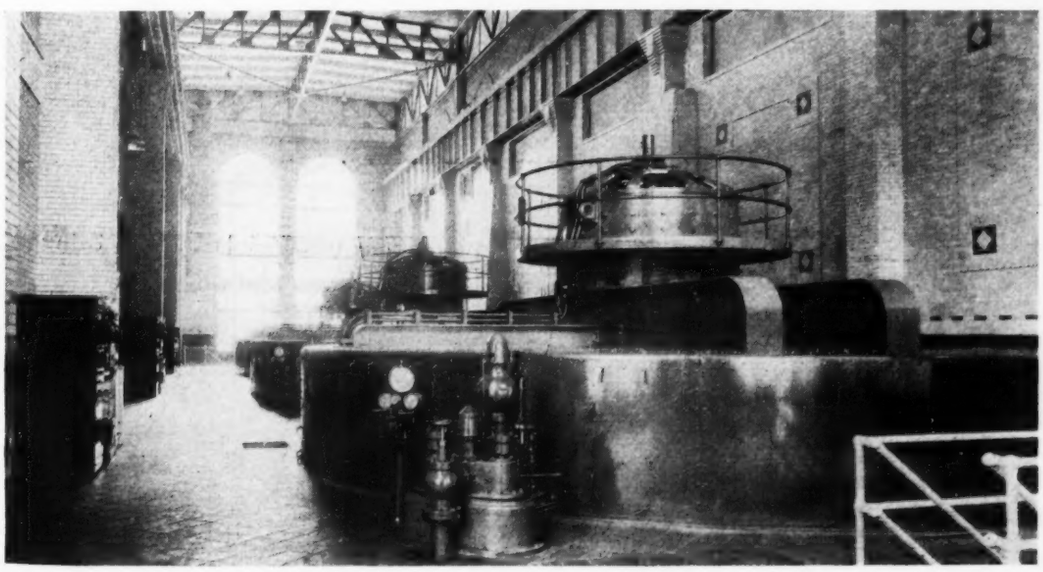
ROLLER GATES PASS AVERAGE SPRING FLOOD

The two roller gates will pass 60,000 cu.ft. of water per second, the average annual spring flood. It will be necessary at excessively high water to remove the flashboards. To do this the I-beams are pulled out of their sockets by an electrically operated 25-ton gantry crane on top of the flashboard bridge. As soon as a beam has been pulled out of the socket the lower end of the beam swings downstream with the current and allows the boards to free themselves. The upper end of the beam being confined in a guide, the crane at all times has a direct vertical pull. When the bottom of the I-beam has been raised to clear the bottom of the flashboard bridge, the beam is made fast to the bridge and the crane hook released. The crane is then moved along to pick up the next beam. Should the power fail and thereby render the crane useless, an emergency tripping device has been installed to release the beams. With the device a hammer blow on a trigger at the upper end of the beam releases the beam from the bridge.

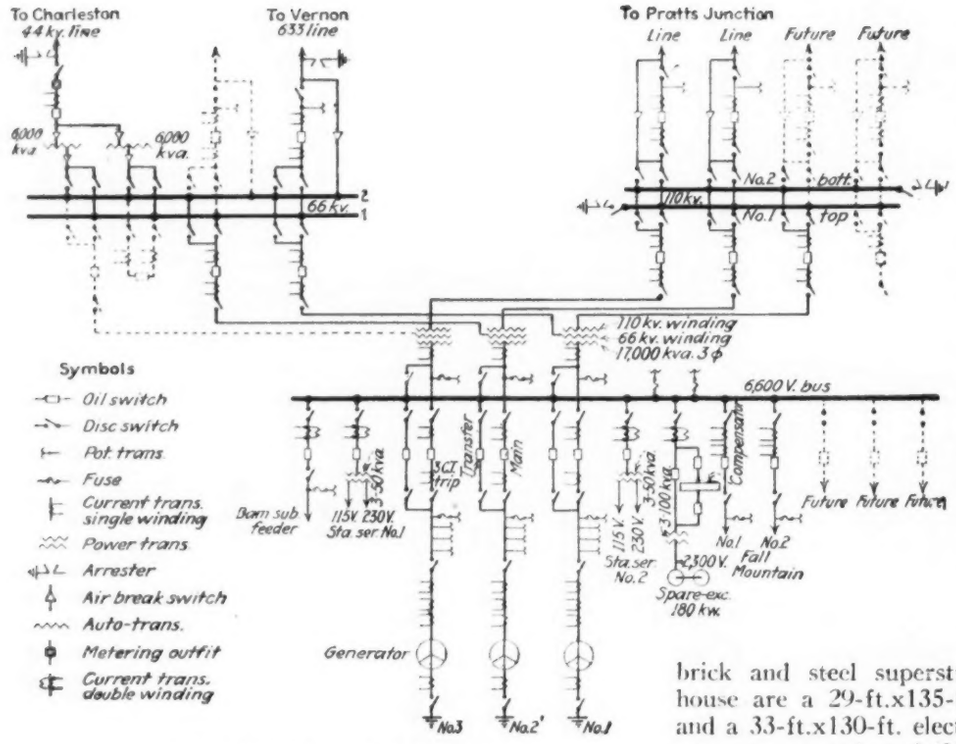
CANAL, ICE DISPOSAL AND RACKS

The canal leading from the dam to the power house is 1,700 ft. long and has an average area of 1,720 sq.ft. It is paved with heavy cut stone. Ice booms are located at the upper end and at the forebay. Ice is sluiced under the power house into the tailrace. The upper end of this sluice is equipped with a 10-ft. x 12-ft. steel gate, operated by two electrically driven screw hoists.

The power house intake consists of six rack sections,



Generating Room Contains Three 17,000-Kva. Units

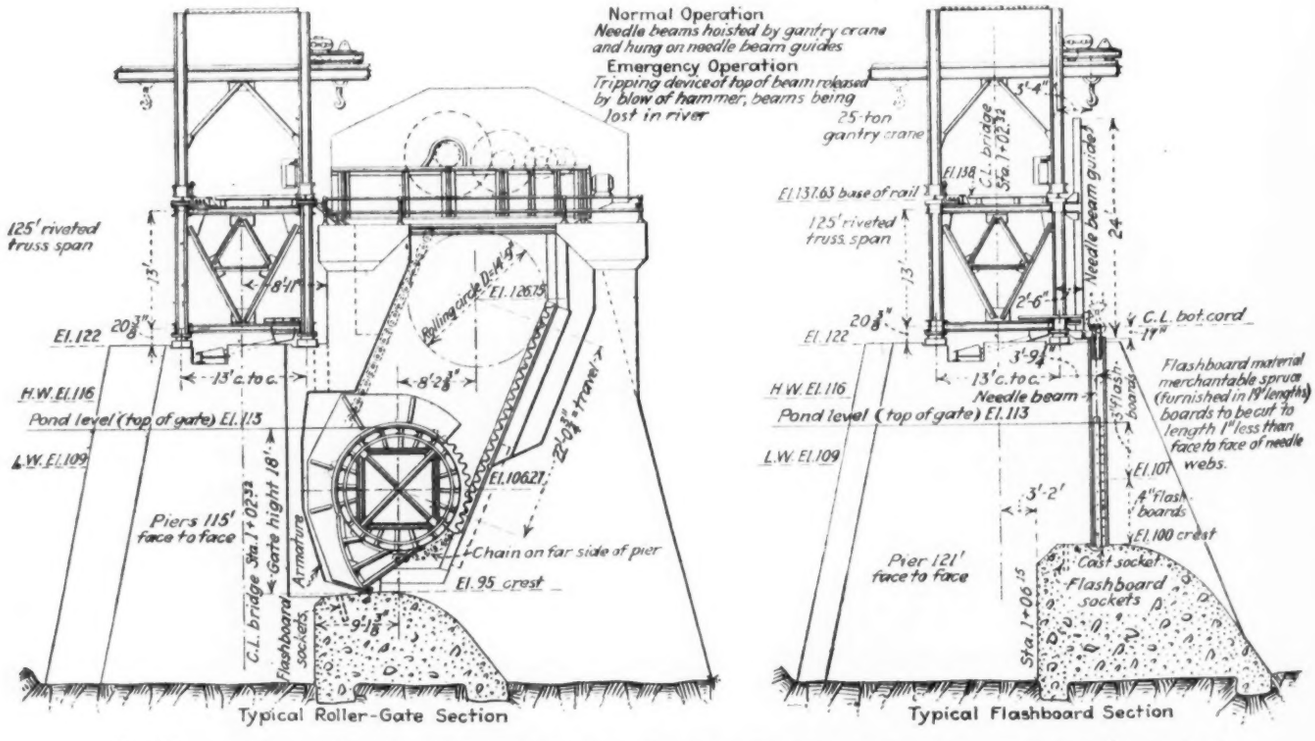


110, 66, 44 and 6.6-Kv. Switching Arrangements

19 ft. x 43 ft. each. The racks are cleaned by a mechanical rack rake. Trash is raked into a trough and flushed into the ice sluice. Compressed air is also used to clean the racks. This is done by placing a brass pipe at the bottom of each rack section and perforating the pipe with $\frac{3}{16}$-in. diameter holes spaced so that there is a hole for each space between rack bars. The holes were so drilled that the air issues from the pipe with an inclination of 45 deg. upstream. When it is desired to clean the racks by this method air is admitted under 125 lb. pressure by means of a quick-opening valve.

Two Broome type gates serve all six of these openings. As these gates will be used only in maintenance and inspection, and as the chance of two units being down simultaneously for repairs is remote, it was not deemed advisable to provide a gate for each opening. These gates are designed to close with full discharge passing through each opening. Filler gates have been provided to balance the pressures before raising the gates.

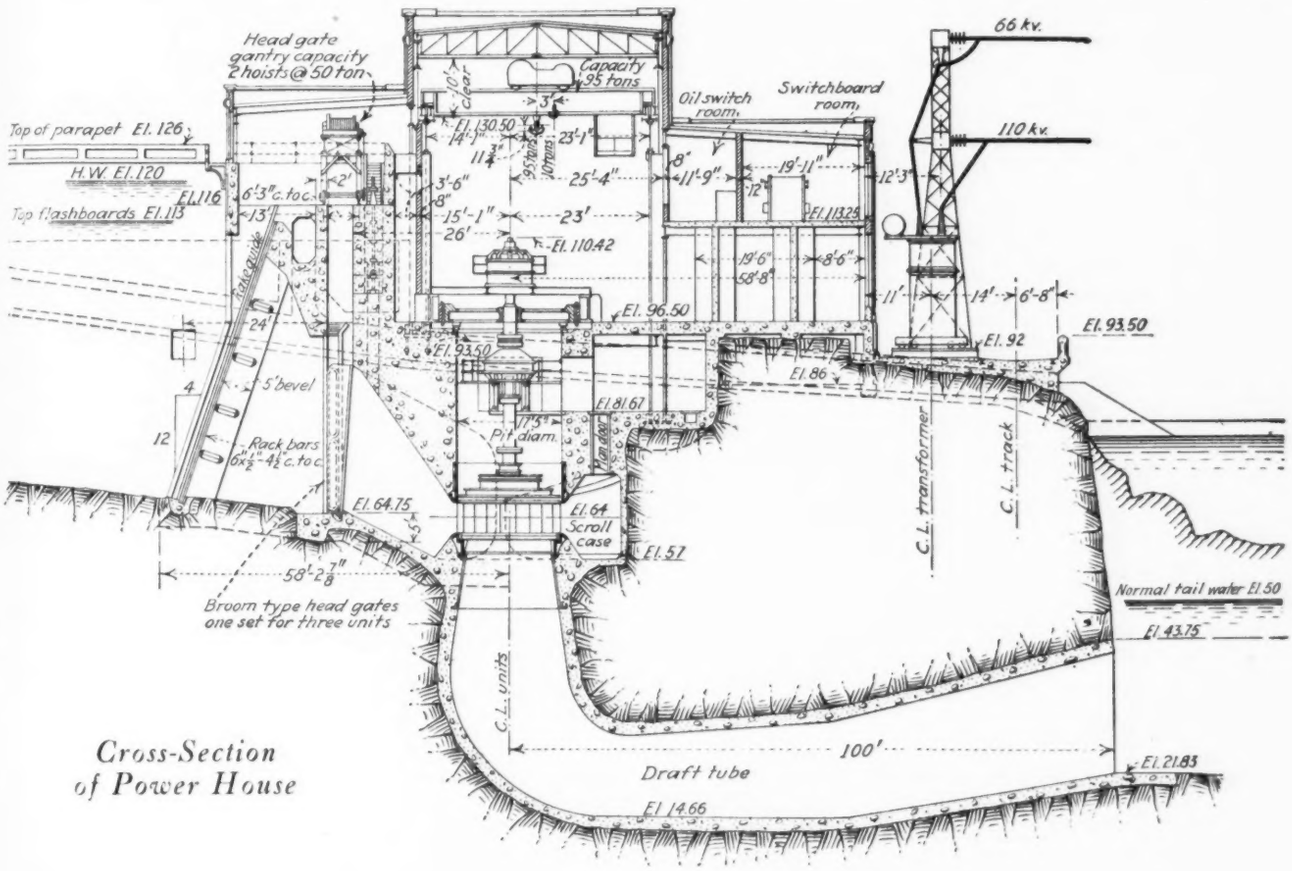
The power house is 42 ft. wide and 182 ft. long with concrete substructure and a brick and steel superstructure. Adjoining the power house are a 29-ft.x135-ft. inclosed headworks building and a 33-ft.x130-ft. electrical building. General Electric generators rated at 6,600 volts, 17,000 kva., 85.7 r.p.m. are used and driven by S. Morgan Smith Francis type turbines. A Gibbs thrust bearing is located between each generator and the turbine cover plate is supported on a structural steel bridge which spans the wheel pit. This construction eliminates the usual lower guide and consequently the lower spider on the generator. It also permits of a lighter generator bridge design, since the only load to which it is subjected is that of the exciter. With this arrangement the generator rotor can be removed for repairs without disturbing the thrust bearing. Venturi meters are used on all three units.



Spillway Assembly Sections, Showing Roller Gate and Flashboard Construction

The electrical design problems at Bellows Falls were brought about largely by the location of the station, which limited the space available for transformers and switching yards, combined with the fact that energy leaves the premises at four different voltages. A simple and inexpensive wiring layout was sought.

The generator and main bus voltage is 6,600. In normal operation each generator and its transformer are operated as a unit, with only one generator tied to the station bus for supplying station service and energy to the Fall Mountain Electric Company for the Bellows Falls district. A 44,000-volt tie interconnects with the Vermont Hydro-Electric Corporation at Charlestown, N. H. A 66,000-volt line runs to Putney and to the station of the New England Power system at Vernon. A double-circuit steel tower line on private right-of-way delivers energy at 110,000 volts to an important switching station at Pratts Junction, Mass., from which lines radiate to load centers in New Hampshire, Massachusetts and Rhode Island.



Cross-Section of Power House

Individual Excitation Provided

Normal excitation is provided by one 250-volt direct-connected exciter per unit, but a motor-generator set is provided for emergencies. The emergency exciter can be connected to any machine by electrically operated circuit breakers located on the main floor field panels and controlled from the main switchboard. It is not intended, however, to parallel any of the exciters and the emergency exciter is not regulated to save the investment which would be required for this purpose.

Ventilation is obtained by taking the air from the generator room, down through gratings into the basement and then into the machines. The warm air is discharged into a sheet steel envelope, which in turn discharges up a flue into the gatehouse. Provision is also made for bypassing some of the warm air into the generator room for heating purposes.

Minimum Direct-Current Wiring

All of the generator power wiring, both alternating-current and direct-current, is "Kerite" insulated and is laid in fiber conduits. The main generator leads, consisting of two 1,500,000-circ.mil cables per phase, are taken directly to the main bus structure, while the exciter and field leads are run directly to the field panels, one of which is located adjacent to each machine. The emergency exciter bus is run between field panels in fiber conduits, while the main field rheostats are located in the basement under the field panels, which arrangement produced very little direct-current wiring.

Each of the governor motor head drives obtains power from two transformers connected in open delta, located in the bus structure, the primaries being tapped solidly upon the generator leads. The secondaries are also unfused. The governor solenoids are alternating-current actuated, and as they are connected in parallel with the head motor leads failure of power for the motor circuit automatically shuts down the machine.

Low-Cost Flexible Service the Design Objective

The bus structure is built of concrete, brick and precast concrete slots and is divided into three sections—the two end sections for taking off station power and local feeders and the middle section for generators and transformers. Phases are separated by 4-in. brick barriers and the bus compartment is backed up with sheet asbestos.

All disconnects except the emergency shunt switches are on the outside of the bus structure walls, which means that the operators have practically no reason for going

into the bus chamber. For the same reason all station transformers are located in the bus chamber. Normally the bus chamber is locked. The doors are of grille construction to provide free air circulation of air around all equipment.

With the oil switches located directly above the bus chamber the layout was further simplified. The generator switches, which are bottom connected, are so located that their terminals fall in line with the leads running from the transfer bus to the main bus, so that none of the power leads really leaves the bus structure. It was necessary, however, to run cables between the switches and bus structure for the auxiliary circuits.

Shortened Control Cables

The control room is located on the second floor directly over the bus and adjacent to the oil switch room, which has a tendency to shorten all inside control conduits and cables. The main switchboard is composed of two rows of panels placed back to back, each with a 6-ft. aisle between. The front panels contain the indicating meters, control switches and signal lights, while the back panels mount the relays and test switches. The cable trench occupies all of the width between boards and not only contains all of the incoming cables but also those running between boards. The latter are, however, run in iron conduits strapped to the bottom of the trench. The boards were shipped unwired so as to allow all vertical lines to be carried up the board in 3-in. tubing by the field electricians.

The generators and transformers are protected by overload and differential relays, while the two 110-kv. lines are equipped with overload, balanced current and ground relays. All other circuits are equipped with overload relays only.

Double-Winding Transformers

The main step-up transformer capacity for the station is obtained by means of three three-phase, 17,000-kva. water-cooled units. All windings are for full capacity, but with 17,000 kva. on one winding the sum of the loads on the two others must not exceed 17,000 kva. The 110-kv. and 73-kv. windings are equipped with ratio adjusters and the neutrals are solidly grounded.

The transformers are situated over the draft tubes. As the station low-tension equipment is all on this side of the station very short low-tension leads resulted. These leads are carried up to the low-tension bushings through concrete towers, and as "Kerite" cable was used no potheads were necessary.

Switch Yard Design

Both the switching yards are of the same general design. Each has a double bus, with one oil breaker to a circuit and selector disconnecting switches. Each oil breaker is also provided with a shunt disconnecting switch. All wiring is of dead-end, strain construction and all structures are made of galvanized steel.

The 110-kv. yard contains three transformer switches and two line switches with space left for three additional circuits. Due to the narrow lot available, it was necessary to put one bus above the other, which gave a fairly high structure. This, combined with the fact that the two lines leave the structure with a 2,080-ft. span, necessitated heavy steel work and footings for the towers.

The 66-kv. yard contains two transformer switches, one line switch and a circuit for two auto-transformers which step the voltage down to 44 kv. for one line. This line was originally supplied through the same auto-transformers from the 66-kv. line which runs to the Vernon station and, therefore, the 44-kv. equipment was simply relocated and rebuilt.

Miscellaneous Services

Each transmission line has a private telephone line and these are all terminated in a booth in the 66-kv. yard. From the booth the lines run in lead-covered cable to the switchboard room to the main telephone board. The lines are connected to buses at both of these points with provisions for testing and in case of complete failure of the cables an instrument is provided in the booth for emergency use.

Station service power is provided for by means of two transformer banks at opposite ends of the bus. Energy for the operation of the roller gates, gantry crane and lights at the dam is provided by means of a 6,600-volt feeder from the power house. This is run in a three-phase underground cable, and is stepped down to 220/110 volts at the dam. As a reserve, a 2,300-volt feeder is also provided at the dam by the local lighting company. Roller gate control and water-level indicator wires are also run from the dam to the power house underground. Power for operating oil breakers is furnished by a 250-volt storage battery.

A complete circulating, filtering and storage system is provided for handling transformer and breaker oil.

The dam and exterior of the station building are floodlighted at night in general by concealed units. "Holophane" high-mounting units with 500-watt lamps were used in the generator room.

The engineering design and supervision was by the New England Power Construction Company, while the construction work was carried out by the Sherman Power Construction Company, both identified with the New England Power Association.

Some Mechanical and Electrical Equipment Installed in Bellows Falls Development

Equipment	Manufacturer	Size	Remarks
Floodgates	S. Morgan Smith Co.	13 ft. 5½ in. x 121	Roller type
Gantry crane	Milwaukee Electric Crane	25 ton	For flashboard operations
Ice sluice gate	S. Morgan Smith Co.	10 ft. x 12 ft.	
Ice sluice gate hoist	Philips & Davies, Inc.		
Mechanical rake	Newport News Shipbuilding & Dry Dock Co.	19 ft.	
Head gates and hoists	Philips & Davies, Inc.	17 ft. 4½ in. x 24 ft.	Broom type gates
Filler gates and hoists	Coffin Valve Co.	2 ft. x 3 ft.	
Power house crane	Niles Crane Corp.	95 tons	10-ton auxil. hook
Generators	General Elec. Co.	17,000 kva.	3 units, vert. type
Turbines	S. Morgan Smith Co.	20,000 hp.	3 units, vertical Francis type
Governors	S. Morgan Smith Co.	115,000 ft.-lb.	Actuator type
Air compressor	Sullivan Mach. Co.	176 c.f.m.	For station service
Air compressor	Lipman	15 c.f.m.	For oil press tank and air brakes
Pumps	Allis-Chalmers Manufacturing Co.	350 g.p.m. centrif.	Transformer and bearing cooling water
Transformers	General Elec. Co.	17,000 kva.	3 units
Switchboard and oil switches	General Elec. Co.		
Outdoor disconnecting switches	Electric Power Equipment Co.		

Letters from Our Readers

A Lighting Pioneer Defends Franklin Specification

To the Editor of the ELECTRICAL WORLD:

I believe that the Franklin specification is an able endeavor to sell the electrical industry higher intensities of illumination. It is the electrical industry that must be sold and it was to the electrical industry that the Franklin specification was dedicated, not to the general public. The editorial in the ELECTRICAL WORLD of September 7 on "The Franklin Specification for Illumination Intensities" could well be considered a mark of our failure to secure recognition for fundamental lighting principles.

I can find no conclusion in the specification that all recommended values could not be considered as minimum. It is so stated as a matter of record in the accompanying "circular of information." "The Franklin specification provides an industry standard of minimum lighting values. . . . In addition . . . an alternative intensity of higher value. . . . This higher value is recommended in preference to the minimum." The "definite case" quoted of "a minimum of 100 foot-candles and then goes on recommending 25 to 100 foot-candles for the same case," is not a definite case at all. The only reference I find that might be so construed is under "Art Galleries" and "Museums"—local lighting on paintings and special exhibits, both of which are tied down to a footnote, "Such factors as the direction of light, etc., color quality or type of fixture, are of unusual importance and require special study." The fact is that a light tone water color or a black and white poster would be satisfactory under 10 foot-candles, but try to render properly visible a dark old master with much less than 100 foot-candles. To be equally visible the brightness of both subjects would be the same. This example illustrates the shortcomings of foot-candle values instead of foot-lamberts, with which probably two or three given intensities would be sufficient to cover the entire industrial and commercial range of intensity requirements. But, again, how could the user of a Franklin specification interpret a foot-lambert?

INTENSITIES IN USE RISE CONTINUALLY

Neither the minimum nor the recommended higher value is given as the last word in illumination intensities. The minimum is merely that point below which an installation shall not be entitled to a Franklin-Red Seal certificate of good lighting. The candle and the oxcart were closely associated in one period in our development. Illumination intensities and the ability-to-see speed of vision are related as cause and effect. As the desire or necessity for visual speed increases, so will the illumination intensities go up; we have had the constant experience that today's maximums are tomorrow's minimums. This upward movement rests not with the illuminating engineer, but with the general public. The successful engineer is not a dictator, but a lighting service interpreter. Hence, logically, the higher values are suggested.

The interjection about the scientist and the ignoramus agreeing on temperature is enlightening, but not particularly relevant. After all, where human comfort is concerned it is not the temperature but the humidity that counts. Witness our hottest September day in New York, 96 deg. F., with a 20 per cent humidity, compared with September 9, temperature and humidity both 78. The latter was a close, uncomfortable day, in marked contrast to the 96 deg. F. day. "The laws governing temperature in street cars and apartments are also quite definite, giving minimum required temperatures only." Maybe so, but not in New York State, as the notice posted in our New York cars reads, "When the temperature is less than 40 deg. F. outside" the companies "must maintain a temperature of not less than 40 deg. F. nor more than 65 deg. F." in the cars. Numerically, considering 40 is but 25 less than 65, the difference is not great. To the human body, however, that 25 could just as readily and usefully be shown on a scale as 250 units. It would then listen as it feels. Both heat and light are human sensations. Thermometer scales and foot-candle values, however, are not proportional to human sensation. The difference between "25 and 100 degrees" covers the comfort range from an overcoat to a bathing suit, while that "between 25 and 100 foot-candles" is frequently stepped over without apperception.

FOOT-CANDLE SPECIFICATIONS MISLEADING

This calls attention to an interesting mental situation which might be called the numerical complex. A thousand mills is only a dollar and a thousand watts is likewise only a kilowatt, having an average value in many communities of only one cent. We have reached the point in lighting where to get out from under this numerical complex we need a new series of units. Instead of foot-candles and watts, we need units for kilo-foot-candles and a more extensive use of the kilowatt.

There is, therefore, nothing vague about a recommendation of 25 to 100 foot-candles; if properly expressed, as above, it then becomes only 25/1000 to 10/100 of a kilo-foot-candle, mere fractions of a unit which we frequently experience without being aware of it. Abroad, where the lux is the unit of illumination intensity, a recent abstract in the June 29 issue of the ELECTRICAL WORLD reported a test in France showing that "production could be increased with increases in the illumination intensity, but not materially beyond an intensity of 25 lux." Twenty-five lux numerically seems to be a worth-while quantity, but in terms of our U.S.A. units it is less than 2.5 foot-candles, a point in our experience well below the knee of the curve.

Don't ride the illuminating engineer; he is young yet in lighting practice experience. Most of the illuminating experts are teachers, lecturers, sales engineers and distributors of word-of-mouth advertising, and at that they are devoting their time to a most necessary practice. The electrical field must be sold better and more adequate lighting. The general consumer is readily sold until he makes contact with his electrical contractor or electrical engineer adviser, and then it is frequently "here's a cheaper way of doing it," losing sight of the fact that human labor and human eyes are the most expensive commodities.

There seems to be an almost universal concern among electrical people generally "to save watts," while a watt-hour today in many industries costs even less than 1/1000 of a cent. I don't know the answer, unless it is, as has been frequently suggested, that the individuals in the electrical industry as a whole have little personal experience with the use of light. They depend upon hearsay and the principle that "doing it cheaper" gets the business from the other fellow.

We have had many years of advertising apparently based on the idea that it is the high cost of lighting service that has held back the lighting millennium. Light is now so cheap, with a constantly lessening margin of profit for those engaged in the sale of lighting service with better lighting equipment, that the incentive to push lighting sales is about on a par with that of sugar in the grocery.

The statement "a number of very excellent illuminating engineers who estimated the intensity of a certain room variously from 6 to 16 foot-candles, the actual intensity showing on the meter as $2\frac{3}{4}$ foot-candles" is open on both ends. This guess proved what every illuminating engineer learns with his engineering ABCs, that the "eye is not capable of judging illumination intensities." And as for this intensity actually being $2\frac{3}{4}$ foot-candles, I would hesitate to believe a foot-candle meter that was even an hour out from standardization, to say nothing about the large number of meters that have been out many months without a check on their accuracy.

Accurate portable photometers have been available in this market for more than ten years, but I doubt if there are even 50 of these instruments available for use by illuminating engineers. As a notable illuminating engineer contributor to ELECTRICAL WORLD recently stated to me, "try to get our people to buy a photometer for me? It costs too much!" Yet this cost is much less than is frequently occasioned by one mistake.

There should be a code giving minimum intensities only. To be personal for a moment, do you want a minimum intensity which might readily become a maximum specified for a hospital operating room? You are on the table for a major operation which may cost you $1,000, and if the surgeon does not find what he is looking for it may cost you your life. Under the Franklin specification the cost for a one-hour operation with the higher value recommended, 200 foot-candles, can be furnished locally at a cost of a fraction of a cent. If there was no provision in the code to prevent it, and I can imagine that there might be, an intensity of 1,500 foot-candles might cost 10 cents an hour, or even $1, but think of the advantage of such an intensity as was shown recently when it was necessary to use this intensity for the taking of motion pictures of operations. Under such an intensity you might benefit, as the surgeons who had this experience remarked that they were enabled to see much more quickly and their vision functioned more satisfactorily. Their previous standard of 500 foot-candles was deemed almost extravagant by them and would be held to be beyond all reason by many engineers. The pictures, however, could not be taken with less than 1,500 foot-candles, and the surgeon noted that he saw so much more than had been possible with the 500 foot-candle intensity formerly believed adequate by the operating lamp manufacturer and the surgeon.

I do not know of any illuminating engineer in the present status of the art who would publicly recommend any such high intensity. The motion-picture man had to have it and now the surgeons are sold on it, according to one of the scientists in the research laboratory of the Eastman Kodak Company. The Franklin specification is left open to take advantage of just such experiences. This is clearly shown on page 10: "The level of illumination now demanded in offices is four to five times that which was considered satisfactory fifteen years ago . . . consideration should be given to planning the wiring capacity per outlet so the lighting can be perhaps doubled in the future."

The foot-candle is probably as good a unit as a degree Fahrenheit, but neither is capable of standing alone. Recommended foot-candle values will be revised upward proportionately with sales ability and the receptivity of higher intensities by electrical men, but we have a long way still to go, notwithstanding the marked progress of the past twenty years for which we are largely indebted to workers in the lighting field similar to those who were responsible for the Franklin specification.

New York. NORMAN MACBETH.

EDITOR'S NOTE.—The Franklin specification is a very constructive contribution to illuminating engineering and should prove helpful to architects, contractors and illumination specialists. The editorial referred only to the table of intensities in the specification and attempted to point out that it is very difficult and even misleading to attempt generalizations on proper illumination intensities. For several years there has been a gradual increase in the "minimum" intensities and a corresponding increase in intensities used. We are still far short of intensity values that should be used, and the major point of the editorial was to the effect that only "minimum" values should be stated for fear that "recommended" intensities prove a stumbling block to higher intensities, because architects, contractors and laymen might consider them "maximum" and offer opposition to the use of higher values. This point is debatable, but the art of illumination is still in a state of flux and fixed values should be avoided if possible.

Porto Rico to Celebrate Light's Golden Jubilee

To the Editor of the ELECTRICAL WORLD:

Readers of the ELECTRICAL WORLD will probably be interested to learn that the "Switzerland of America," as the island of Porto Rico was called by the late Theodore Roosevelt, has also joined the world-wide celebration of Light's Golden Jubilee.

A sponsoring committee, made up of Governor H. M. Towner, the Hon. Antonio R. Barceló, President of the Senate; Hon. Guillermo Esteves, Commissioner of the Interior; the Hon. Miguel A. Muñoz, chairman of the Public Service Commission of Porto Rico, and the Hon. R. H. Todd, Mayor of San Juan, the capital city of the island, has been designated. The executive committee, under the chairmanship of Frederick Krug, vice-president and general manager of the Porto Rico Railway, Light & Power Company, is composed of local representatives of nationally known firms and local electrical dealers, as well as government-owned public utilities.

The main celebration will concentrate in San Juan, where the new three-million-dollar white Georgia marble Capitol will be floodlighted. The radio program to be broadcast from the United States on the night of October 21 will probably be rebroadcast here or received direct from the stations up North.

Local merchants have been asked to make unusual illumination of their show windows and buildings for a period which will start on October 12, Columbus Day, and terminate on October 21.

Considerable newspaper space will be devoted this month and the next to stories on Edison's life and Light's Golden Jubilee in its local, national and world-wide aspects.

The Commissioner of Education for the Territory has been asked to have the schools hold appropriate exercises during the period of the celebration. The committee has supplied him with lecture notes on Edison and other appropriate literature for Current Events classes.

G. NAVARRO-FUENTES,
Supervisor of Publicity.
Porto Rico Railway, Light & Power Company,
San Juan, P. R.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Two New Units at Shawinigan Falls.—J. B. MACPHAIL.—Several innovations have been introduced in the recently installed 43,000-hp. vertical units at Shawinigan Falls and the author has outlined the engineering features of the equipment, the departures from the previous methods and some of the engineering objectives. One innovation consists of rubber-lined guide bearings instead of lignum vitæ bearings, and it is said that this is the largest installation upon which such material has been used. Cast-iron draft tube vanes have been included to support the draft tube bell and the superimposed load of the scroll case and machinery. This feature has simplified the heavy reinforced concrete construction previously needed to support these loads. All switching is done on the high-tension side by means of oil circuit breakers.—*Electrical News and Engineering (Canada)*, September 1, 1929.

Transmission, Substations and Distribution

Flux Distribution in Three-phase Transformers.—G. STEIN.—Due to iron saturation and potential drop in the supply lines, the magnetizing current of three-phase transformers is often distorted, which leads to objectionable higher harmonics in the lines. Assuming sinusoidal primary current, the author presents a mathematical method for the pre-calculation of the time character of the magnetizing current, for three-legged and five-legged core type transformers. For the latter design of transformers a simple method is given to calculate flux distribution in the yokes and outer legs. The use of the method is illustrated on the recently built 100,000-kv. testing transformer of a large German concern.—*Elektrotechnische Zeitschrift*, August 15, 1929.

Round versus Triangular Cables.—E. WEISS.—Great advances have been made in recent years in the electrical design of lead-sheathed high-tension cables, due to a much more accurate knowledge of internal stress distribution. The outcome of these developments brings, among other achievements, three-phase cables of essentially triangular cross-section instead of the formerly used round type. Taking the electrical superiorty of such triangular cables for granted, the author undertook to investigate their mechanical features. As such he considered relative weight and flexibility. Shipping charges and the moving of cable drums in field are considerably lessened with triangular cables due to a weight of 9 to 15 per cent less than equivalent round cables. This weight reduction permits manufacturers to produce correspondingly longer cables in one piece, which, in turn, reduces the required number of splices. Ease of bending a cable is of great advantage to the installation crews, particularly if the cable has to be fished into manholes. Since no such bending tests on cables had ever been made before, the author had to construct special bending machines, to determine the relative flexibility of a round and a triangular cable. Two equivalent three-phase cables for 27 kv. indicated average of 30 per cent higher flexibility of the triangular type.—*Elektrotechnik und Maschinenbau*, August 11, 1929.

Illumination

Modern Tendencies in Domestic Lighting.—R. WALDO MAITLAND.—A brief evaluation of the uses and the general idea underlying present tendencies in domestic lighting has been offered by the author, and a number of illustrative examples of unusual and interesting treatment have been made. Of particular interest is the endeavor by the author to offer solutions for some of the elements encountered in home lighting but not confronted elsewhere.—*Illuminating Engineer (England)*, September, 1929.

Heat Applications and Material Handling

Cross Field Generators.—E. ROSENBERG.—In accordance with modern machine design, an Austrian firm now builds cross-field generators of the all-steel type, insuring thereby much lighter weight and greater ruggedness, features which are greatly appreciated on portable welding outfits. Originally only the series type of winding was used, but lately a shunt winding has been added, to obtain full flexibility of compound character. Another recent accomplishment was the addition of two movable pole pieces, which allow a gradual variation of the magnetic flux. The movable part is a cylindrical steel plug which can be screwed into a close-fitting steel tube by means of a hand-wheel. By giving the steel tube a carefully calculated gradually decreasing wall section, a perfectly proportional change of generator current can be obtained in relation to any position of the plug in the tube. The generators are usually driven by a direct-connected induction motor and are available in sizes of 10 to 800 amp. The smaller units are now frequently used for arc lamps in motion-picture projectors, with the regulating poles remotely controlled by either a sprocket chain or a small pilot motor. The larger sets serve welding purposes.—*Elektrotechnische Zeitschrift*, August 15, 1929.

Electrophysics, Electrochemistry and Batteries

Motions of Dielectrics in Dense Fields.—A. GYEMANT.—Under the influence of dense high potential fields, motions can be imparted to a dielectric medium in four distinct ways: (a) By the action of the dielectric itself; (b) by the displacement of a double layer dielectric; (c) by a motion of space charges, and (d) by mechanical action. The author explains these little known phenomena and gives practical examples for each, as follows: For (a) commotions of an oil surface with an electrically charged sphere above it; the accumulations of dust particles on insulators, and the electric puncture of wet oil; for (b) attraction of impurities in oil toward an electrically charged electrode, and utilization of this method for the purification of oil (Draeger method). Cataphoresis and endosmosis are two phenomena belonging in this class; for (c) electric precipitation of dust (Cotrell process), used widely as smoke and dust abater; for (d) electric wind observed readily on sharp edges of high voltage leads, and so pronounced as to be able to turn a small reaction pin-wheel.—*Elektrotechnische Zietschrift*, August 22, 1929.

Telegraphy, Telephony, Radio and Signals

Mica Condensers.—F. GERTH and H. GONNINGEN.—The requirements of modern radio work call for condensers of very low dielectric losses. Among the various types of possible dielectrics, such as air, compressed air, oil, glass, paper and mica, only the latter is used today for radio purposes. The suitability of mica depends entirely upon its quality. The loss figure of the available mica qualities are as follows: Black magnesia-iron mica, 8 watts; brown spotted mica, 4 watts; clear green Muskowit mica, 0.8 watts; second quality ruby mica, 0.2 watts; first quality amber-ruby mica, 0.16 watts. Only perfect sheets of the latter quality, 0.05 to 0.2 mm. thick, can be used. Originally the sheets were copper coated, which method was later abandoned in favor of tinfoil electrodes. Lately copper coating has again been taken up. Condensers can now be made to within plus minus 5 per cent of the nominal value and are being tested with two to three times rated voltage. End plates, formerly made of glass, are now Steatit plates or heavy packages of mica sheets for short wave sets. Condensers for d.c., which have no losses and are not subjected to heating, can be solidly compounded.—*Elektrotechnische Zeitschrift* August 8, 1929.

News of the Industry

New York Subway Contract Awarded

City Authorities Accept Only Bid, That of New York Edison Company, at a Price Aggregating $39,235,329 in Ten-Year Period

FORMAL award of the contract for operating the new subway system of the city of New York was made on September 27 to the New York Edison Company, the only bidder. Acceptance of that company's offer became a virtual certainty when the date for opening bids was reached at the end of June and it was known that neither the Interborough Rapid Transit Company nor the Brooklyn-Manhattan Transit Company had competed. These companies, which operate the existing subways, were not able to expand their plants sufficiently to generate power for the coming ones, and for the city itself to build power plants at this time was regarded as out of the question.

As previously reported by the ELECTRICAL WORLD, the New York Edison's price will be 7.99 mills a kilowatt-hour. This will bring the city's light and power bill on the new subways to $514,595 in 1931, the first year of the contract, according to estimates of the Board of Transportation engineers. The estimated cost for 1940, the final year of the contract, is $6,309,703. The cost, it is estimated, will increase steadily from 1931 on as various sections of the new subway system are placed in operation. Over the ten-year period the total estimated cost is $39,235,329.

The price is $5,500,000 below the estimated cost of producing the power in a city-owned plant, which, it is estimated, would cost between $30,000,000 and $40,000,000. Should the city decide later to build its own plant, however, it may cancel the Edison contract by giving notice one year in advance. In the first five-year term a saving of $5,000,000 is reached by taking the Edison company price instead of building a plant. For the second five-year term the difference in cost is only about $1,000,000.

The power generated under the contract will be delivered to substations to be built along the line of the subway. The substations necessary to the operation of the first section of the subway from 204th Street to Park Place will cost $2,700,000. The cars, motor equipment and signal equipment for the section will cost $17,000,000.

Should the Edison profits on this contract exceed 7 per cent in any one year, an indirect return will accrue to the city through the special franchise tax. New power houses or additions built by the company will pay taxes in the same manner as other real estate. As the rate in the power contract is said to be the lowest ever quoted by the Edison company, it is unlikely that profits will rise to a point resulting in any tax return to the city.

An article covering in detail the engineering features involved in carrying out the contract will be printed in the ELECTRICAL WORLD in an early issue.

Damage to Power Lines from Florida Storm Slight

A dispatch to the ELECTRICAL WORLD from a news correspondent at Jacksonville, Fla., says that little damage was done to power transmission systems in that state by the tropical storm that touched both the east and west coasts of the peninsula at the end of last week and caused temporary interference with electric service in Miami and other cities. A utility expert just back in Jacksonville from Miami reported no damage to the lines serving that city. Slight damage is reported from Fort Lauderdale, though only a few poles were down. No damage worth mentioning occurred to the system serving Pensacola, to which the storm spread in its last stages.

Muscle Shoals Energy Sought by Tennessee Electric Power

The Tennessee Electric Power Company expects within six months to establish a transmission-line connection with the Muscle Shoals plants to permit the use in Tennessee, especially in the growing industrial center of Nashville, of much of the Muscle Shoals power that has been going to waste in past years. The increasing power market in Nashville, Chattanooga and other sections served by the company makes it necessary to provide additional sources of power—much of which, it is believed, can be supplied from Muscle Shoals and thus avoid economic waste of that power.

The Tennessee Electric Power Company feels that the construction of a line from Nashville, connecting its system on the west with that of the Alabama Power Company, and corresponding with its connection from Chattanooga to Georgia on the east, is necessary to insure further dependable service to its customers even though the Muscle Shoals line be not used to absorb a portion of the Muscle Shoals power. The western interconnection the company is now building to Muscle Shoals will establish a direct connection to the Alabama system, including the steam plants on the Warrior River.

Wilbur Calls Boulder Dam Conference at Capital

Applicants for Power Will Meet Government Officials and Engineers to Discuss Technical, Legal and Financial Aspects of Enterprise.

SECRETARY WILBUR of the Interior Department announced at Washington on Wednesday that a number of requests for the power to be generated at Boulder Dam have been received at the department and that those requests insure a demand for power exceeding all that can be generated and also assure repayment of the cost of the dam as contemplated in the law. He said further that he had asked the principal applicants for this power to come to Washington on October 14 to discuss with the officials of the department definite arrangements for the production and distribution of this power.

The secretary has called L. N. McClellan, chief electrical engineer for the Reclamation Bureau, with headquarters in Denver, to Washington for that meeting. Prof. W. F. Durand of Stanford University, consulting engineer for the bureau, will also probably be present. Mr. Wilbur has asked those participating to be prepared to discuss the technical, legal and financial aspects of the problem of handling this power. The applicants for large amounts of power are the city of Los Angeles, the Metropolitan Water District, the Southern California Edison Company, the Southern Sierras Power Company and the States of Nevada and Utah.

Niagara-Hudson Appointment in Line with Lamont's Stand

Announcement was made at Albany on Thursday of the appointment of Randall J. Le Boeuf, Jr., of that city as general counsel of the Niagara-Hudson Power Corporation. Mr. Le Boeuf will have general supervision of the legal department of the parent company and its subsidiary operating companies, according to announcement made at the office of the corporation in the capital, where it was asserted that his appointment is a reiteration of the company's attitude as expressed recently by Thomas W. Lamont, "that the company desires at all times and in all ways to cooperate with the state and the public in bringing about development of power for the best interests of all concerned."

Mr. Le Boeuf was graduated from Cornell Law School in 1920 and has since specialized in public utility and water-power matters. He served for two years as assistant attorney general

in charge of all the state's water-power and canal matters, acting as counsel to the Water Power Commission and Canal Board.

Trade Commission Resumes Utility Hearings

The Federal Trade Commission resumed its hearings in the public utility investigation at Washington on Thursday morning. The commission's efforts to identify a mysterious document said to have been circulated last summer and alleged to have contained views of power interests and to have attacked methods of accounting prescribed by the Federal Power Commission were unavailing. Paul A. Schoellkopf, president Niagara Falls Power Company, and M. O. Leighton, consulting engineer, Washington, D. C., testified they knew nothing of such a document.

At the conclusion of the hearing Chairman E. A. McCulloch said that the commission's investigation of the utilities will be suspended for several weeks on account of the illness of Judge R. E. Healy, its chief counsel. Thursday's hearing was the first since the recess taken in June and was devoted, like most of the previous hearings, to publicity phases of the inquiry.

Regulation of Holding Companies

President Sloan Tells Great Lakes Convention that This Question Must Be Met—Program Covers All Phases of Central Station Operation and Administration

THAT the electric utilities should not "shy away" from the question of the regulation of holding companies, but should give it serious attention, is the advice of President M. S. Sloan of the National Electric Light Association to the industry he represents. Speaking before the convention banquet of the Great Lakes Section at French Lick, Ind., on Friday evening of last week, Mr. Sloan declared that, though such regulation is difficult of conception on account of the diversity of interests it would affect and the changing character of the business it would control, these difficulties are not reasons why the industry most affected should refuse to consider the question; rather, they are reasons why it should not refuse.

Mr. Sloan adverted also in his address to the matter of utility mergers. He said that the reorganization of the electric utility industry into larger units was a natural process justified by changes in the technique of operation and management. It has not been and is not now in every case true that consolidation and combinations are properly conceived and executed, but as a general thing they are. The trouble is that the virtues of the reintegration of the industry are not clear to the public, a condition that must be corrected.

This necessity, so forcefully presented by Mr. Sloan, was also the major subject of the opening address of the convention, made by G. C. Neff, president of the division, on the previous day. Mr. Neff made a strikingly good presentation of the political aspects of the utility business and concluded with a strong plea for earnest efforts to reach public understanding.

Paul S. Clapp, managing director N.E.L.A., followed Mr. Neff with an inspiring recital of the growth of the industry and of its growing importance in the homes of the nation. Mr. Clapp summed up the political and economic forces that now engage the attention of the industry. It was his belief that the testimony in rebuttal to be given by the industry before the Federal Trade Commission, which had been planned for the fall of this year, would probably have to be deferred until early in 1930 on account of the illness of Judge Healy, chief counsel of the commission. In regard to the Couzens bill providing for federal regulation of interstate power transmission, Mr. Clapp said that only 3½ per cent of the total amount of power generated in the country could properly come under such regulation.

C. F. Hirshfeld of the Detroit Edison Company spoke on the value and necessity of research in the electricity supply industry. He said that only 10 per cent of the money spent in research is directed toward the investigations in pure science which must be the foundation of the applied science of the future. As a result applied science, he said, is on the way to bankrupting itself.

Marshall E. Sampsell, chairman of the Commercial National Section, speaking on Friday, linked together the two matters of electrical merchandising and customer ownership of utilities securities. Customer-owners should, he said, on account of their financial interest in the company be most responsive to efforts made to extend the use of electrical service.

An exhaustive summation of the sources of information in the electric light and power fields was presented by Edwin J. Fowler, statistician of the Commonwealth Edison Company.

Basing his statements on the analysis of 41 circulars referring to as many security offerings of public utilities, George C. Mathews of the Wisconsin Railroad Commission said that the selling practices indicated by information indefinitely presented or in some cases left entirely out of these circulars were such as to bring the operations almost within the province of the "blue sky" laws of many states. It is only by taking account of and correcting these conditions that the utilities can assure to themselves the continuous flow of capital which is necessary for their growth.

The time has come, said A. D. Bailey, chairman of the National Engineering Section, at Saturday's session for the engineer to consider his work in a broader view and to appreciate the economic and humanitarian aspects of his profession.

L. B. Andrus, president Indiana Electric Corporation, showed the connection between the work of the engineer and every other activity of the company.

Other papers listened to with much interest by the 850 men in attendance concerned rates, competition and power sales, industrial development activities, customer relations, lighting service, lamp sales and other subjects. A feature of the convention which must have provided many of those who saw it with inspiration for the celebration of "Light's Golden Jubilee" was the illumination of the Japanese gardens of the hotel. This work was done under the direction of the lighting committee of the division by the Interstate Public Service Company with equipment loaned by the manufacturers.

Preparing for Hearings on Couzens Bill

Counsel Engaged to Conduct Proceedings Before Senate Committee on Interstate Commerce—Separate Inquiry Into Investment Trusts May Be Had

COUNSEL in the person of William C. Green of St. Paul has been engaged by the Senate interstate commerce committee to act for the committee in its inquiries under Senate Resolutions 6 and 80 relating to the setting up of a federal Commmission on Communications and Power as proposed by Senator Couzens of Michigan, chairman of the committee.

Mr. Green will begin his work for the committee about October 15. It will consist at first of personal examination and study of data bearing on the inquiries to be made. These are expected to be extensive. He will be the chief examiner of witnesses to appear at future hearings before the committee. It has already held hearings on the radio phase of the subject. These have not been completed, and it is expected that they will be finished before other phases are taken up. It is stated at the offices of Senator Couzens that the inquiries may not be fully under way before the regular session of Congress to begin in December.

Senator Couzens' proposed commission would, as previously explained, be concerned with radio, telegraph and telephone operations and with the interstate business of power companies whose operations are across state lines. Regulatory power now possessed by the Federal Radio Commission would be transferred to the new commission, as would the authority over telegraph and telephone operations now exercised by the Interstate Commerce Commission. Jurisdiction over interstate power lines would be a new federal venture.

Senator Couzens has indicated that

the establishing of investment trusts, or the forming of holding companies partaking of investment trusts, by power companies will be looked into by the committee. He also has said that he may endeavor to bring about a committee inquiry into investment trust operations in general. This probably would be independent of the inquiry now being planned, and, if made, it would be conducted with the view of determining whether investment trust operations should or legally can be regulated by the federal government.

On September 30 Senator Wagner of New York offered in the Senate a resolution directing the Federal Trade Commission to make available to the New York State investigatory commission recently appointed all data having to do with operations in that state collected by the Trade Commission in its general investigation of electric power company affairs. Senator Couzens was quoted as saying that he would support Senator Wagner.

Farewell Dinner Given to Delegates to Tokyo

Frank Gill of England, Luigi Luiggi of Italy, Gano Dunn and Elmer A. Sperry Make Appropriate Addresses in New York.

A FAREWELL dinner in honor of the delegates to the World Engineering Congress at Tokyo, Japan, was given at the Hotel Astor, New York, on Thursday evening, September 26, by members of the four major American engineering societies and affiliated organizations. The delegates will sail from San Francisco next week. They number 258 Americans and a good representation from many European countries. The latter were especially honored at the dinner, where the chief speeches were made by Frank Gill of England, past-president of the Institution of Electrical Engineers of that country, and Senator Luigi Luiggi of Rome. G. S. Davison, president of the Gulf Refining Company, acted as toastmaster.

Mr. Gill said that there are now about fifty associations of engineers dealing with things international, nineteen of them being concerned with electrical matters. Speaking for his own society, he felt that with the large number of bodies there was risk of lack of coordination and suggested that electrical men get together to further progress outside the field of standardization, for which the present International Electrotechnical Commission is the appropriate and effective agency.

Senator Luiggi, speaking for the Italian delegates, dwelt enthusiastically on modern Italy, alluding to its progress in many directions and especially to the development of hydro-electric power, now being used to the extent of 5,000,000 hp. He told how, in the use of her natural resources, Italy is tapping even her volcanic heat. Near Florence three turbines of 5,000 hp. each are operating on steam from subterranean sources. Factories, the speaker asserted, are being remodeled according to modern principles, including electrification.

Gano Dunn, in a finely phrased address of "hail and farewell," spoke of the rewards obtained by those who drop their everyday affairs, important as these may appear, for such a journey as that to Tokyo.

Dr. Elmer A. Sperry, president A. S. M. E., who is chairman of the American committee, spoke of rapidity of Japanese progress in recent years and the appropriateness of recognizing it by a convention in the Japanese capital.

Tokyo Delegates Leave for Pacific Coast

A special train carrying American and European engineers on the first stage of their journey to Tokyo, to attend the World Engineering Congress, left Jersey City Wednesday morning for Washington, where they attended a reception and dinner given in the evening by the Japanese Ambassador, Katsuje Debuchi. On Thursday they were scheduled to call on President Hoover at the White House. The President is honorary chairman of the American committee of the World Engineering Congress.

Immediately after the reception the party, augmented by a group of Washington engineers, were to leave on a special train for Chicago en route to San Francisco, where they will embark on two special ships for the Tokyo meeting. Upon their arrival at Tokyo the engineers will be received at the Imperial Palace on the eve of the opening of the congress by Prince Chichibu, heir to the throne and patron of the congress.

Among the foreign delegates to the congress who left Jersey City on Wednesday were Frank Gill of London, Prof. E. H. W. Weibull, Dr. H. K. Weiberg and Prof. H. B. M. Pleijel, all of Sweden; Prof. G. Schonweller and Prof. T. E. Thomsen of Denmark; Colonel A. Pernod of Paris, and Dr. Charles A. Fry of Essen, Germany. Senator Luigi Luiggi and nine other delegates from Italy left for the Pacific Coast on Sunday, September 29, and expected to sail from Seattle for Tokyo on October 5.

Railway Men Confer

Annual Convention of A.E.R.A. at Atlantic City Hears from Leaders—Coffin Prize Awarded to Chicago & South Bend Line

AWARD of the Charles A. Coffin electric railway medal to the Chicago, South Shore & South Bend Railroad was announced at the annual convention of the American Electric Railway Association, held at Atlantic City, N. J., this week from Monday to Friday. In marked contrast with many other once prosperous electric railways, hard hit by the ever-increasing use of buses and private automobiles, the South Shore line, after adopting the most modern equipment, showed in 1928 an increase in passengers carried of 8½ per cent over 1927 and 24 per cent over 1924.

Charles Gordon, the new managing director of the association, dwelt on the necessity of protecting both investors in electric railway securities and the communities served by them through putting the companies on a sound financial basis.

The usual great attendance characterized the meeting, of which one feature was international talking motion pictures. Those presented were Secretary of Commerce Lamont, Lord Ashfield, head of the London Underground Railways; Ernest Reuter, head of the Berlin Street Railways, and Andrew W. Robertson, chairman of the board of the Westinghouse Electric & Manufacturing Company.

Paul Shoup, executive vice-president Southern Pacific Company, San Francisco, was elected president. The 1930 meeting will be held in that city.

Better Market Analysis and Cost Accounting

Speakers at Swampscott Convention of Association of Electragists Think that Path of Progress for Contractor-Dealers Is Along This Line

BETTER market analysis and thorough cost accounting will go a long way toward putting the contractor-dealer branch of the electrical industry on a firmer footing. This was the declaration of several speakers at the twenty-ninth annual convention of the Association of Electragists International, held this week at Swampscott, Mass.

Vice-President Leavitt L. Edgar of the Edison Electric Illuminating Company of Boston welcomed the delegates to New England at the opening session on Tuesday morning, after which President Clyde L. Chamberlin of San Francisco addressed the convention, stressing the importance of acquiring a broader outlook on industry affairs, of striving for closer co-operation within the electrical family and of seeking profitable business rather than volume business.

Dr. Hugh P. Baker, manager of the trade association department, Chamber of Commerce of the United States, gave an excellent talk on solving trade difficulties through associated effort. He pointed out that bankers are now paying more attention to co-operative ability as a factor in credit granting and described the usefulness of trade-practice conferences in co-operation with the Federal Trade Commission as a means of ironing out undesirable methods of doing business. Dr. Baker made a strong plea for executive interest in association work.

R. A. Balzari, marketing counselor, McGraw-Hill Publishing Company, New York, pictured the sales opportunities before the electragist in the industrial field, outlining the motor

market and electric construction and maintenance openings in plants of small and medium size as based on a McGraw-Hill survey of ten cities. Through concentration of sales effort, he said, the electragist should increase his profitable business materially in industrial plants of under 1,000 hp. connected motor load, virtually becoming the electrical department in concerns where the maintenance of a specialized electrical force is economically unwarranted.

Other papers will be noted next week. The James H. McGraw award for leadership in the contractor-dealer branch of the electrical industry went to John Kuhlemeyer of Chicago.

Leo E. Mayer of Chicago was elected president and Earl N. Peak of Marshalltown, Iowa, vice-president, together with nine directors of geographic divisions in the United States and Canada.

"Light's Golden Jubilee" Plans Go On

President's Participation at Dearborn Seems Certain—Preparations in Edison's Home District, New York, Ohio, Georgia and Colorado

PLANS for President Hoover's hoped-for participation in the "Light's Golden Jubilee" exercises at Dearborn, Mich., on October 21, which seems assured, are complete. According to these, the President, arriving in Detroit early that day, will ride through the streets of the city on the way to Dearborn and will be the guest of Henry Ford at luncheon. In the afternoon he will visit the laboratory, and he will speak at a banquet at Dearborn at 7:30 p.m.

Golden globes are being placed on electric light poles along Broad Street, Newark, N. J., in preparation for the celebration of "Light's Golden Jubilee" to be conducted under the auspices of the Newark Chamber of Commerce on October 14 to 21, inclusive. This lighting will be done at the expense of the Public Service Electric & Gas Company. To arrange the celebration the chamber has appointed a general committee of 150, which includes Mayor Congleton, the city commissioners and other officials. William Bittles, Chamber of Commerce president, heads the committee. Schools, clubs and merchants will co-operate and the program will end with a Chamber of Commerce luncheon meeting.

In "the Oranges" and Maplewood, N. J., a Chamber of Commerce program co-ordinating with Newark's is under way. On October 11 a new junior high school bearing Edison's name will be dedicated at West Orange. Golden lights will form a "pathway of incandescence" throughout the entire length of Park Avenue, ending at the gate of Llewellyn Park, where Mr. Edison's home is situated.

Governor Roosevelt of New York has fallen into line with the executives of many other states by issuing a proclamation calling for public observance of "Light's Golden Jubilee" on October 21 "to signalize the fiftieth anniversary of the cumulation of the research and efforts of Edison, foremost in the broad, uncharted field of electrical experimentation."

The Central Square at Youngstown, Ohio, was flooded with golden light on Thursday night, September 26, when the city began its observance of "Light's Golden Jubilee." A large portrait of Edison on the north side of the square was lighted by a battery of floodlamps. The jubilee committee had a replica of Edison's first lamp on display at the fourth annual radio and electric show, and the inventor was also honored through the distribution of 10,000 golden medallion-souvenir pocket pieces.

Mayor I. N. Ragsdale announces that Atlanta will celebrate "Light's Golden Jubilee" on October 21. He has named Preston S. Arkwright, president of the Georgia Power Company, as chairman of a committee to arrange the celebration.

One of the conspicuous events in the Denver celebration will be an illuminated football game between the University of Denver and Colorado College at the new Denver University stadium on the night of October 19. The Gas & Electric Building is to be lighted in spectacular manner. One night of Edison Week is to be devoted to an air circus at Lowry and Curtiss fields, where elaborately illuminated planes will maneuver. At the Union Station a public dance is to be staged, in which kerosene lamps and styles of long ago will figure.

Purchases and Mergers

New Bedford Gas & Edison Light Acquired by Associated Gas & Electric —Fitkin Sells Coast Counties Gas & Electric

AGREEMENT for the acquisition of the New Bedford (Mass.) Gas & Edison Light Company by the New England Gas & Electric Association, affiliated with the Associated Gas & Electric Company, was announced last week at Boston. The New Bedford company is one of the most important in southeastern New England. Besides serving the city of New Bedford and suburbs, it supplies energy through wholesale agreements to the Cape & Vineyard Electric Company (another Associated property) and to some of the properties of C. D. Parker & Company in upper Cape Cod. About half the industrial plant load of New Bedford, including many important textile concerns, is supplied by the company. Its total plant investment was $16,867,911 at the beginning of this year. With the Cambridge Electric Light Company, the Associated system now includes two of the best-known electric properties in the Bay State besides important gas holdings and smaller electric utilities.

Sale for $26,801,327 of the Pacific Public Service Company by A. E. Fitkin & Company was announced this week by Mr. Fitkin, who did not reveal the identity of the purchaser, afterward disclosed as the Standard Oil Company of California. The company disposed of was organized in Delaware in 1928 and brought about consolidation of the Coast Counties Gas & Electric Company, the California Consumers Company and the California Consolidated Water Company. The first named, with headquarters at Santa Cruz, Calif., serves, by means of a hydro plant at Swanton and purchased energy, electrical customers at the two places named, Gilroy, Hollister, Watsonville and other small cities in west-central California.

The Lake Ontario Power Corporation has applied to the New York Public Service Commission for permission to transfer its franchises and plant to the New York State Electric Corporation. The petitioning corporation has its principal office in Sodus, Wayne County. It has been concerned in the project under way for generating power on Lakes Keuka and Lamoka, near Penn Yan, N. Y. Both companies are now part of the Associated Gas & Electric system.

The Empire Gas & Electric Company has applied to the New York Public Service Commission for approval of the transfer of its franchises and system to the New York State Electric Corporation. Both are now Associated Gas & Electric Company properties. The Empire company has its principal office in Geneva and operates plants in Wayne, Seneca, Ontario, Cayuga and Onondaga Counties.

Everett M. Hurst, operator of the Rural Light & Power Company in Indiana, has been authorized by the Public Service Commission to sell his property to the Southeastern Indiana Power Company for $38,000. It comprises principally a 39-mile electric distribution system near St. Paul, Ind.

The Iowa-Nebraska Light & Power Company has purchased the transmission lines owned by the village of Hickman and the distribution system operated by the village of Denton, both in the Lincoln territory.

The Farrugat (Iowa) Public Service Company has sold its business, consisting of electric power, telephone and ice plants, to the Iowa-Nebraska Light & Power Company.

An offer of $20,000 for the electric distribution system in Defiance, Iowa, has been made by the Iowa Public Service Company and will be submitted to a vote.

Fifty citizens of Benson, Minn., have petitioned the Otter Tail Power Company to submit a proposal to purchase the municipal electric plant.

The General Water Works & Electric Company has asked the Alabama Public Service Commission for approval of its acquisition (already noted) of the River Falls Power Company, the Pea River Power Company, the Andalusia Light & Power Company, the Opp Light & Power Company and the Alabama Utilities Company, all of Alabama.

The Surprise Valley Electric Light & Power Company has applied to the California Railroad Commission for authority to sell its properties in Modoc County, to the California Public Service Company, and the latter has requested authority to pay $15,400 therefor.

Three companies are now interested in purchasing the city-owned power plant at Revelstoke, British Columbia. The Western Canada Hydro Corporation says that it is prepared to bid, the Dominion Electric Power Company of Regina, Saskatchewan, has also inquired and a syndicate in Spokane, Wash., is ready to make an offer.

Court Sustains Sale of Insull Interest in Neon Lights

The sale by the Insull interests of their majority stock in the Claude Neon Federal Company, which controls the advertising and display rights of the Claude Neon Lights, Inc., in the West, Middle West and Southwest, with other advertising properties, for $7,000,000, was sanctioned in the New York State Supreme Court on Monday. The court denied the motion of the Claude Neon Lights, Inc., for an injunction against the sale to the Rainbow Luminous Products, Inc., and Rainbow Light, Inc., described as the plaintiff's chief competitors.

The court said that it could not agree with the plaintiff's contention that the Federal Electric Company, the Insull subsidiary concerned, was "subject to fiduciary duties akin to those arising from a copartnership." The defendants showed, added the court, that the Federal Electric Company was "an independent company, having an old established illuminating sign business in territory centering on Chicago before it came in contact with the Claude Neon Lights, Inc., in 1926 and 1927."

The plaintiff obtained a stay until Friday in an effort to overrule the decision, which, it asserts, will inflict upon it a possible loss exceeding $36,000,000.

City of Niagara Falls Fights Increase of Water Rental

Contending that its industrial prospects may be affected adversely, the city of Niagara Falls on September 28 obtained from the Supreme Court of New York at Albany a writ of certiorari directing the Water Power and Control Commission of the state to show why it assessed $50,000 rental against the Niagara Falls Power Company for the use of 500 sec.-ft. water under the terms of a decision reached June 27 last. The action is the first to be taken by any municipality on the Niagara frontier against rulings of the Water Power and Control Commission with respect to rentals charged by the state for diversion of Niagara Falls water.

George W. Knox, corporation counsel of Niagara Falls, said that the state commission fixed a charge of but $60,000 under a previous ruling to cover the diversion of 4,400 sec.-ft. and that the June 27 ruling, amounting to a 90 per cent increase in the levy against the power company, is out of proportion with the amount of water used and the importance of the privilege granted. He told the court that as a result of the decision, since the increased rental will be reflected in rates to consumers, Niagara Falls is facing the likelihood of the withdrawal of some of its industries.

The writ granted requires the commission to produce in the Appellate Division of the Supreme Court on or before November 1 all its records in the series of hearings preceding its determination to levy the additional rental.

The additional 500 sec.-ft. diversion was made possible after revision of the international treaty. In fixing the rental at $50,000, the commission stated that the total rental charge of $110,000 for a full total of 4,900 sec.-ft. diverted was a fair and equitable charge for Niagara's power. At the June hearing, when the new rental was fixed, the commission decided to assess the company $103,437.50 in back rentals, due from October 26, 1925, to July 1, 1929.

Further Modification of the New-Kanawha Project

An agreement has been reached between the New-Kanawha Power Company and the Chesapeake & Ohio Railroad in regard to further modification of the plans of the power company for the construction of a dam at Hawk's Nest, W. Va., it was announced at Charleston on September 26 following a commission hearing on the application of the power company for permission to modify the plans originally approved. As previously reported (ELECTRICAL WORLD, August 26, page 346), these original plans, which were for two dams, two power houses and two connecting tunnels, were modified to provide for the construction of the Hawk's Nest dam only, a power house near Gauley Junction and one tunnel much longer than either of the tunnels originally contemplated.

By the further modifications agreed upon by representatives of the power company and the railroad the height of the dam would be decreased from 800 ft. to 796 ft., and that of the gates increased from 15 ft. to 19 ft. The width of the gates would be decreased from 51 ft. to 50 ft. So built, the dam, it was testified, would withstand a flood 25 per cent greater than any in the history of the New River.

Arkansas Power & Light Cuts Lighting Rates

More than $600,000 will be clipped from the electric bills of about 60,000 domestic and commercial customers of the Arkansas Power & Light Company in 170 communities under reduced rates approved by the board of directors of the power company last week. The new rates will be filed with the city councils of the different cities and towns and, if approved by them, will become effective January 1.

The new schedules standardize rates for energy in all communities at 7 cents per kilowatt-hour for the first 6 kw.-hr. per room and 5 cents for all in excess of that quantity, plus a varying service charge. There also is a special combination lighting-refrigerating-cooking rate, starting at 7 cents and dropping to as low as 2 cents. Under the present block-rate schedule there is a top domestic rate of 10 cents a kilowatt-hour for the first 300 kw.-hr. Commercial customers will, under the new schedule, have a top rate of 7 cents, scaling down to 2½ cents. Industrial rates are not affected, as these are as low as can be obtained for similar service under comparable conditions, President H. C. Couch said.

Briefer News

TRIPLE DRIVE IN KEARNEY (NEB.) STATION.—The Central Power Company, an Insull subsidiary, will soon let contracts for $175,000 worth of improvements at its Kearney (Neb.) plant. The new equipment includes two 980-hp. Diesel engines, thus giving the plant three sources of energy—water power, steam and Diesel engines.

CANADIAN GOVERNMENTAL CONFERENCE ON WATER POWER POSTPONED.—The conference between the Dominion government and representatives of Ontario and Quebec in regard to the relative rights of the Dominion and provinces to water powers has been postponed indefinitely. It was to have taken place on October 2, but the pending Ontario elections interfered.

CARRYING WIRES UP THE ROYAL GORGE.—The Southern Colorado Power Company is stringing transmission lines to the top of the Royal Gorge, near Canon City, Colo., about 2,000 ft. above the riverbed. The power will be used for pumping water to the top, where a bridge and hotel are being built, and for an inclined electric railway which will carry passengers to the rim of the gorge.

INDIANA HAS AN "ALL-ELECTRIC" FARM.—The first "all-electric" farm in north central Indiana has been put in operation near Marion, under the sponsorship of Purdue University, the Indiana General Service Company and the county agent. At a public opening and demonstration short speeches were made by Prof. T. E. Hienton of Purdue, T. M. Parker, chairman rural service committee of Indiana, and Arthur Shugart, owner of the farm.

DANVERS, MASS., BALKS AT GRANTING RIGHT-OF-WAY TO SALEM-HAVERHILL LINE.—The Eastern Massachusetts Electric Company has petitioned the Massachusetts Department of Public Utilities to grant locations for a transmission line through Danvers, which the selectmen of that town refused on September 16. The power company plans a transmission line from Salem to Haverhill and Newburyport to connect with the line now supplying service in Malden, Melrose and Everett. The new line would pass through

Salem, Danvers, Wenham, Topsfield, Boxford, Georgetown, Newbury, Newburyport, Groveland and Haverhill. Approval of location in all towns except Danvers has been obtained.

FOR POWER DEVELOPMENT ON SALMON AND ZIGZAG RIVERS, ORE.—The Equitable Securities Company of San Francisco has filed an application with the Oregon Engineering Department in which authority is asked to store 150,000 acre-feet of water from the Salmon and Zigzag Rivers and to appropriate 2,500 sec.-ft. of such stored water for the development of electric power.

COLORADO RIVER STATES WILL NOW SEEK HARMONY AT ALBUQUERQUE.—Still another conference on allocating the waters of the Colorado is scheduled. This time representatives of New Mexico, Arizona and California will meet in Albuquerque, N. M., on October 14, with Special Assistant Attorney General Donovan presiding. Governor Dillon of New Mexico has also extended an invitation to the governors of the other basin states.

NEW ENGLAND POWER PLANS TO CONNECT WITH FIFTEEN-MILE FALLS PLANT.—The New England Power Company has filed a petition with the Massachusetts Public Utilities Commission for leave to build a 6½-mile high-tension transmission line through Massachusetts to connect with lines from the Fifteen-Mile Falls development. The line will cost $360,000 and will pass through Dracut, Andover and Tewksbury.

VICTORIA AND VANCOUVER SERVED BY NEW SUBSTATION.—The British Columbia Electric Railway Company has put into service a substation at Bay and Government Streets, Victoria, just completed at a cost of $200,000. The districts are being cut into this plant on a gradual scale, and by the end of this year it will be the distribution center for the whole of Greater Victoria. The company will also build a 10,000-kva. substation at Fifth Avenue and Fir Street, Vancouver, to cost $165,000, with provision for doubling its size.

RAPID GROWTH OF OIL-PUMPING LOAD IN OKLAHOMA.—So rapid has been the increase in demand for power in the Oklahoma City oil field that in two weeks recently the Oklahoma Gas & Electric Company connected 3,000 additional horsepower for pipe-line pumping in that territory. In order to supply this extra load it was necessary for the company to increase the capacity of its substation at Oklahoma City, build five miles of 33-kv. line and a 1,000-kva. substation north of Edmond and build a mile and a half of 22-kv. line northeast of Guthrie and install a 500-kva. station. It was necessary to install a 1,000-kva. substation at Guthrie and change the voltage of the Guthrie-Perkins line. This new construction was all ready in eight days. In addition a contract was made for an additional 500-hp. pipe-line station south of Vinco, necessitating the building of four miles of 22-kv. line and a substation

PORTLAND, ORE., TO STUDY MUNICIPAL OPERATION.—The city of Portland, Ore., has set aside the sum of $25,000 to finance a study regarding the acquirement and operation of municipally owned electric utilities. Information is sought upon the amount of taxes a city plant will not pay that a private plant does, the difference in rates and the approximate amount of money Portland would be required to pay for electric properties now serving the public.

LOUISVILLE COMPANY WILL SUPPLY ENERGY FREE TO SIGN ADVERTISING CITY.—Robert Montgomery of the Louisville Gas & Electric Company, who is chairman of the plans and schedule committee of Advertising Louisville, Inc., has announced that the latter organization will erect a large electric sign on the top of a building near the

foot of Second Street for which energy will be supplied without cost by the Louisville Gas & Electric Company. The sign, intended to advertise the city to those driving across the municipal bridge connecting Louisville with Jeffersonville, now nearing completion, will be 49 ft. wide and 21½ ft. high and will show an outline of Kentucky, with red and green neon tube lettering.

MARYLAND COMMUNITIES, DENIED ELECTRICITY THREE TIMES, TRY AGAIN.—Six communities in Montgomery County, Md., have petitioned the Public Service Commission to order the Consolidated Gas, Electric Light & Power Company to extend its lines into that county. The petition asserts that after seven years' effort to obtain electricity from three companies now serving the county—the Potomac Electric Power, the Potomac Edison and the Damascus Power & Light—the citizens consider it their right to be served by the Baltimore company.

ROCHESTER-GENEVA INTERCHANGE OF POWER DECLARED A SUCCESS.—Interchange of power between the Rochester & Geneva (N. Y.) plants of the Associated Gas & Electric System, begun August 1, has resulted in efficiency and economy, according to Thomas H. Yawger, of the Rochester Gas & Electric Corporation. Under the arrangement, the two properties conserve and dispatch power according to load requirements, hour to hour. The Rochester unit utilizes the new Caneadea Dam as its power reserve and the Geneva plant Seneca Lake. The interconnection, Mr. Yawger says, not only permits the plants to lighten each other's load, but provides a water reserve for dry weather.

MORE POWER FOR NEW BEDFORD.—Plans are being studied for the enlargement of the main steam generating station of the New Bedford Gas & Edison Light Company at an approximate cost of $1,500,000, according to a recent statement before the Massachusetts Department of Public Utilities by David A. Beaman, general manager. The load of the company is increasing so rapidly that it expected that steps will be undertaken to push this development during the present fall. The present generating capacity of the company is 115,000 kva.

NEW YORK POWER & LIGHT TO ADD 55,000-HP. UNIT AT SPIER FALLS.—Plans for the immediate addition of a 55,000-hp. generating unit to the Spier Falls hydro-electric plant of the New York Power & Light Corporation on the upper Hudson became public at Glens Falls last week. Added to the present development of 30,000 hp., this will make the plant the largest on the Hudson River and put it among the more important water-power plants in the East. A million dollars was stated as the amount to be spent.

MEMBERS OF POWER COMMISSION TO VISIT CUMBERLAND FALLS.—It is reported from Washington that the members of the Federal Power Commission—Secretary of War Good, Secretary of the Interior Wilbur and Secretary of Agriculture Hyde—will soon personally inspect the site at Cumberland Falls, in Kentucky, around which a national controversy has raged between scenery conservationists and defenders of the project to develop water power there. The Cumberland Falls railroad station is 13 miles from the falls themselves, and the route is over a clay road, with a trip across the river by skiff involved.

READING RAILROAD CONTEMPLATES PHILADELPHIA-NEW YORK ELECTRIFICATION.—Upon completion of its present twenty-million-dollar electrification program in the Philadelphia area, the Philadelphia and Reading Railroad will enter upon plans to electrify the road all the way to New York, according to the forecast made by Agnew T. Dice, president of the railroad, speaking at the dedication of the railroad's new station on North Broad Street, Philadelphia. Mr. Dice announced that the Reading Company had expended more than $120,000,000 for improvements of all kinds since the World War.

SEATTLE PLANS COMBINED LIGHT DEPARTMENT BUILDING AND SUBSTATION.—J. D. Ross, superintendent of lighting for the city of Seattle, has plans under way for construction of a 26-story building to house the offices of the

City Light Department, contain a central substation and in addition provide offices for rental. A basement and subbasement are planned for the power substation, and the building will be floodlighted from top to bottom by four searchlamps. The city owns a site, 240 ft.x111 ft. in area, at Third Avenue between Madison and Spring Streets, on which the structure will be built.

COMMERCIAL SECTION, P.C.E.A., MEETS AT LOS ANGELES.—The first conclave of the new association year by the Commercial Section, Pacific Coast Electric Association, was held in Los Angeles on October 3 and 4. Speakers scheduled were W. L. Frost, past-president P.C.E.A.; C. E. Houston, Commercial Section, N.E.L.A.; H. C. Rice, manager merchandising department, Southern California Edison Company, who was to discuss the proposed wiring code, and E. B. Criddle, president P.C.E.A. Vice-president A. M. Frost was scheduled to talk at the luncheon on Thursday.

NEW 35,000-KW. UNIT AT AVON STATION ALMOST READY.—Finishing touches are being made to the new 35,000-kw. turbo-generator in the Avon station of the Cleveland Electric Illuminating Company. It will bring the total capacity of this station to 140,000 kw. Any further extensions will necessitate the constructiton of a new wing. Along with the new unit two additional boilers burning pulverized fuel and accessory equipment have been installed and a fourth stack has been built. It was also necessary to string another three-wire line from Avon to Clinton, 28 miles, exhausting the capacity of the steel towers.

NEW LIGHTING RATES FOR HOUSTON.—The new rates proposed by the Houston (Tex.) Lighting & Power Company and printed in the ELECTRICAL WORLD for September 7 (page 490) have been accepted by the City Council with two amendments, one giving the consumers the option of paying according to the old schedule, the other maintaining the existing profit-sharing agreement between the city and the company. The Mayor says that the new rate, estimated to bring a saving of $250,000 a year to customers, will be tried out for a certain period, after which, if it be found unsatisfactory, expert appraisers may be called in.

ELECTRICITY CALLED IN TO HELP LIGHTNING TESTS ON AIRPLANES.—Artificial lightning tests on airplanes to determine whether or not a lightning bolt striking a plane will damage it were started at the laboratories of the Ohio Insulator Company, Barberton, Ohio, on September 20. A Chicago technical magazine, the Stewart Aircraft Company of Cleveland, the Department of Commerce and the insulator company are co-operating in performing the tests. An ordinary fabric-covered plane will be suspended in the air with its motor running and a bolt of electricity discharged at it from a special electrical apparatus. In other tests Stewart Aircraft will ascertain the effects of similar bolts on an all-metal multi-motored transport type of ship.

NEBRASKA GOVERNMENT'S PUBLIC PLANT.—The contract for the joint heating and lighting plant for the new Nebraska Capitol and the University of Nebraska has been awarded for $110,350. The building, 190 ft. by 83 ft., will be on university ground, and a conduit nearing completion will connect the plant with the Capitol, a mile distant.

PEOPLE'S WEST COAST AND ALLIED COMPANIES' ACTIVITIES.—A 50-year franchise for extending lines and service along nearly every county road south and west of South Bend, Wash., has been granted by the Pacific County commissioners to the People's West Coast Hydro-Electric Corporation. The franchise is part of the corporation's plan to link its properties at Ilwaco, Cathlamet and South Bend, serve all the adjacent territory and develop a power supply on the upper Naselle River. Work is now in progress on a 33,000-volt line from South Bend to Ilwaco. A 22,000-volt line has been built from North Bend to Reedsport. The Western States Utilities Company reports activity by other allied companies as well. The California Public Service Company has installed a small hydro plant at Alturas and is building an auxiliary 600-hp. Diesel-engine plant there, with provision for three times that capacity. At Lakeview, Burns and Prairie City, Ore., 1,320 hp. in all in additional Diesel-engine sets is being installed.

P. G. & E. ORDERS EQUIPMENT FOR FIRST TWO STATIONS ON MOKELUMNE RIVER.—Progress with the development plans of the Pacific Gas & Electric Company for the Mokelumne River, where a chain of four plants will eventually be built, is indicated by the company's orders for $400,000 worth of Westinghouse equipment to be installed in the first two stations. These orders include an 11,000-kva., 10,000-volt, 300-r.p.m. vertical waterwheel generator for the Salt Springs station and two 30,000-kva., 11,000-volt, 225-r.p.m. horizontal waterwheel generators for the Tiger Creek plant.

STEAM PLANTS IN NORTHWEST TAKE CARE OF WATER SHORTAGE.—Water shortage in the Northwest is not causing alarm to the power companies. They anticipated and prepared for it, and their steam auxiliaries—added to by the 35,000-kw. unit of the Puget Sound Power & Light Company's new Shuffleton plant and the new 20,000-kw. unit at the Northwestern Electric Company's Lincoln Street station in Portland, both of which went into operation in September—are adequate to care for the situation. Reports from companies operating in western Oregon and Washington are of stream flows ranging from slightly to considerably below normal. The worst situation is said to be on the Clackamas and Oak Grove Rivers. In this territory steam in recent weeks had taken care of from 50 to 58 per cent of total power output, instead of its normal quota of 45 to 50 per cent, and the hog-fuel supplies of the Portland Electric Power Company when the report was made had been depleted faster than expected, making possible a forced resort to oil for fuel.

SAN JOAQUIN CORPORATION RENTS TRANSMISSION LINE FROM TURLOCK IRRIGATION DISTRICT.—The California Railroad Commission has approved an agreement entered into between the San Joaquin Light & Power Corporation and the Turlock Irrigation District on July 1 for the leasing by the district of its transmission line to the power corporation for the purpose of selling and delivering to the Modesto Irrigation District electrical energy either from its own system or that of the Turlock Irrigation District. Under the agreement the power corporation will pay to the Turlock Irrigation District a rental of 1 per cent a month on that portion of the Turlock district's investment used. The price to be paid for power purchased from irrigation districts and provisions for the purchase by the corporation of surplus electrical energy from Turlock district is covered by other agreements. The power corporation ex-

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue of July 6, page 46.]

National Electrical Manufacturers' Association—Wardman Park Hotel, Washington, Oct. 7-11. S. N. Clarkson, 420 Lexington Ave.. New York.

American Society of Mechanical Engineers—National fuel meeting, Bellevue-Stratford Hotel, Philadelphia, Oct. 7-10. C. V. Rice, 29 West 39th St., New York.

International Association of Electrical Inspectors—Southern Section, Ansley Hotel, Atlanta, Oct. 15-17. R. L. Gatewood, P. O. Box 1743, Atlanta.

Kansas Section, N.E.L.A.—Hutchinson, Oct. 17-18. H. Lee Jones, Kansas Gas & Electric Co., Wichita, Kan.

Public Utilities Association of West Virginia—Charleston, W. Va., Oct. 23-24. A. Bliss McCrum, P. O. Box 1483, Charleston, W. Va.

Great Lakes Division, N.E.L.A.—Engineering Section, Lorain Hotel, Madison, Wis., Oct. 23-26. L. F. Hickernell, Stevens & Wood, Jackson, Mich.

American Engineering Council—Mayflower Hotel, Washington, Oct. 24-25. L. W. Wallace, 26 Jackson Place, Washington, D. C.

North Central Division, N.E.L.A.—Accounting Section, Nicollet Hotel, Minneapolis, Oct. 28 and 29. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Public Utilities Association of Virginia—Chamberlin-Vanderbilt Hotel, Old Point, Va., Nov. 21 and 22. A. B. Tunis, 306 Grace Securities Bldg., Richmond, Va.

American Institute of Electrical Engineers—District meeting, Chicago, Dec. 2-4. F. L. Hutchinson, 33 West 39th St., New York.

pects, the commission says, to save approximately $20,000 a year in production of electric power through the arrangement.

FRANKLIN, TENN., WITHOUT LEGAL ELECTRIC SERVICE.—The Tennessee Railroad and Public Utilities Commission having refused a certificate to the Franklin Power & Light Company to serve that city because of clauses in the franchise of which the regulatory body disapproved, and having also held that the Southern Cities Power Company, now serving Franklin, has no legal right to do so, because the franchise of its predecessor expired in August and no new franchise has been granted, the city is without any properly sanctioned electric service and must amend the first-named company's charter or grant a new one to the Southern Cities Power or some other company.

Commission Brief Filed in Los Angeles Compensation Suit

Arthur T. George, chief counsel for the California Railroad Commission, has served upon the Southern California Edison Company and forwarded to Washington for filing in the United States Supreme Court its brief in the valuation case which has been carried to that court by the company. The case is the outgrowth of proceedings instituted by the city of Los Angeles before the Railroad Commission on February 28, 1925, for the valuation of the electrical distribution properties of the Edison company in sixteen additions to the city annexed subsequently to the original purchase of the Edison lines within the city in 1922. After numerous hearings, the commission issued its order fixing the compensation which the city should pay for the properties in question at $865,000, including approximately $20,000 severance damages. The company had contended for an award of $3,166,960.

The decision of the Railroad Commission was upheld by the California Supreme Court on May 13, 1929, and rehearing of its decision was denied by that court on June 10. The Southern California Edison Company in the latter part of August petitioned the United States Supreme Court for the issuance of a writ of certiorari for the review of the decision of the California Supreme Court. It is the company's contention that the order of the commission was void in that certain elements of value were not considered and, further, that the statutory provisions under which the commission proceeded are unconstitutional.

The Railroad Commission in its brief urges that the petition for a writ of certiorari should be denied inasmuch as it does not show that the challenged decision of the California Supreme Court is in conflict with the decisions of the United States Supreme Court or that any federal question is properly presented which has not previously been determined by the court.

Commission Rulings

WHAT CONSTITUTES PROOF OF REASONABLENESS OF RATES.—Evidence on the part of an electric company that it is one of four public service companies operated as a unit by a holding company, the power passing without metering from the facilities of one to the other and the expenses of operation and line loss being apportioned among the companies on an arbitrary basis, is not sufficient to prove the reasonableness of the company's rates. So holding, the Pennsylvania Public Service Commission, adjudicating complaints against new rates of the Harmony Electric Company, said that this company, with the burden of proving its new rates reasonable, had failed to offer evidence as to the value of its property or to show reasonably its expenses of operation and ordered the company to file a tariff reinstating its former rates.

CHARTER OF LOCAL COMPANIES DISAPPROVED WHERE TERRITORY IS ALREADY ASSIGNED AND OCCUPIED.—The Public Service Commission of Pennsylvania has refused to approved charters for the Bedford County and Friends' Cove Rural Electric Companies over the protest of the Penn Central Light & Power Company and affiliated companies, which had previously been chartered and had built a transmission line to serve the territory concerned. Testimony was submitted in an attempt to show that applicants could furnish the service at the most economical rate, but the commission held the statements to be indefinite and contradictory, not being based on accurate surveys and estimates. Moreover, it was admitted that the applicant companies planned to charge rates which would be determined after actual costs were known. The type of competition involved, the commission said, would be ultimately burdensome to the consumer, and the commission had the power to regulate rates in any event.

PROPER CHARGES TO FIXED CAPITAL BY UTILITY PURCHASING PROPERTY OF ANOTHER.—In granting to the California Telephone & Light Company permission to transfer all its property to the Pacific Gas & Electric Company and cease to operate, the California Railroad Commission laid down rules covering the proper records of the transaction on the books of the purchasing utility. It said that the Pacific Gas & Electric Company should charge to fixed capital accounts not more than the estimated historical cost of the properties bought, plus net additions from the date of valuation to the date of transfer, and should credit to its reserve for accrued depreciation the depreciation estimated to have accrued on such properties. Should the actual purchase price of the properties as represented by stock issued and liabilities incurred and indebtedness to be assumed exceed the estimated historical cost less depreciation and the current and other assets acquired, the purchasing utility should charge such excess to its profit and loss accounts.

NEBRASKA COMMISSION DISAPPROVES ISSUE OF SECURITIES WHERE EARNING POWER OF COMPANY IS NOT ESTABLISHED.—Holding that it is its duty to know that property capitalized has sufficient earning power to pay its way from the time the securities are issued, the Nebraska State Railway Commission has refused its approval of a stock issue of $20,000 common and $20,000 preferred, as well as $20,000 of 6 per cent bonds, asked for by the Cornhusker Electric Company. This is a new company, with headquarters at Grand Island. It has recently built a transmission line connecting the municipal plant at Grand Island with the town of St. Libory, 11 miles distant, has options on plants at the small towns of Vesta and Inland, and is building a number of farm lines. The commission found from the testimony that it would take from three to five years to develop the rural business, and until the company can show the establishment of an earning power approval of any stock securities will be withheld. Only $10,700 has been paid into the company treasury.

Recent Court Decisions

REHEARING REFUSED IN HARTINGTON (NEB.,) CASE.—The Nebraska Supreme Court has refused the rehearing asked for by the Interstate Power Company in the case affecting a contest at Hartington, Neb., between the Interstate Power and its local subsidiary on the one hand and the Western States Utilities Company, backed by the municipality, on the other and hinging on the right of competition. This stubbornly fought case was reported quite fully in the ELECTRICAL WORLD for July 27 (page 203), August 31 (page 445) and previous issues.

RIGHT OF OREGON MUNICIPALITY TO EXTEND ITS LINES BEYOND CITY LIMITS AGAIN UPHELD.—The Oregon Supreme Court has denied a petition for rehearing filed by the plaintiff in the case of Yamhill Electric Company vs. the City of McMinnville. This was a suit involving the right of a municipality to extend publicly owned electric service beyond the city limits and into operating territory recognized as being sufficiently and adequately served by a private utility. McMinnville in this instance extended its power lines into a field claimed by the Yamhill Electric Company, and suit was brought to restrain the municipality from invading the territory; but the Supreme Court, in its original opinion, held that the laws of Oregon contain no provisions under which a municipally owned utility may be enjoined from extending its lines beyond corporate limits or submit to regulation otherwise by the Public Service Commission.

FELLOW-SERVANT AND CONTRIBUTORY-NEGLIGENCE CONTENTIONS HELD NOT APPLICABLE IN UNUSUAL ACCIDENT.—Award of damages for the death of a foreman in the employ of the Broad River Power Company (sued by Hill) was upheld by the Supreme Court of South Carolina, notwithstanding defendant's contention that the accident came under the class of those due to fellow servants and therefore involved assumption of risk and contributory negligence, excluding recovery. In this case one squad of men engaged in clearing a right-of-way had left a tree cut through but still standing which subsequently fell upon the foreman of another squad who passed the tree in the course of his duties without knowledge of the condition in which it had been left. (148 S. E. 870.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Men of the Industry

W. E. Wood to Assume Executive Duties in New York

William E. Wood of Richmond, president of the Virginia Electric & Power Company, has been named vice-president in charge of operations of the Engineers' Public Service Corporation with headquarters in New York City. For six months Mr. Wood has held the title of vice-president of the Engineers Public Service Corporation, holding company for the Stone & Webster interests. As vice-president in charge of operations, he will be second in command to President C. W. Kellogg and will be in direct charge of operations of various utility corporations in the East and South. He will assume his new duties November 1. He will retain his connection with the Virginia Electric & Power Company as chairman of the board of directors, having been selected to succeed Harry H. Hunt of Boston, resigned. Mr. Wood has been with the Stone & Webster interests for 23 years and during this period of service has been connected with its properties in Boston, Jacksonville, Fla.; Houston, El Paso and Galveston, Tex., and more recently in Virginia.

ROBERT W. MILLER, executive vice-president of the Pacific Lighting Corporation, has been made a member of the board of directors of the Los Angeles Gas & Electric Corporation, succeeding the late William Baurhyte.

R. G. CHAMBERLAIN, for many years representative in Oregon and Washington of the Electric Household Utilities Corporation, and its predecessor, the Hurley Machine Company, Chicago, has been appointed vice-president of the company and placed in charge of sales in the eleven Western states. Mr. Chamberlain joined the sales organization of the Hurley Machine Company in February, 1916, and for some time was sole factory representative in Oregon and Washington, making his headquarters in Seattle. With the coming of the Thor shops and the consequent enlarging of the sales organization in the territory he was made district manager for the two states.

T. H. NESS, formerly division manager of the Umpqua division of the California Oregon Power Company, has been appointed division manager of the Coos Bay division of the Mountain States Power Company to take effect September 1. Mr. Ness will establish his headquarters in Marshfield, Ore. He will succeed A. L. MARTIN, who has been appointed district manager of the western Wyoming properties of the Mountain States Power Company. Mr. Ness has been affiliated with the California Oregon Power Company since 1921, when he was appointed superintendent of construction of the Line 11 extension into Chiloquin, Ore., having removed to the West from St. Louis, Mo., where he was formerly superintendent of electric distribution for the East St. Louis & Suburban Company. Later he was appointed general superintendent of construction for the California Oregon Power Company and subsequently, when the Douglas County Light & Water properties were purchased and added to the California Oregon Power Company system, Mr. Ness was appointed division manager of the newly formed Umpqua division.

Dr. Matschoss Visits America

Conrad Matschoss, professor Dr. ing. e.h., director of the Verein Deutscher Ingenieure (Society of German Engineers), is at present visiting the United States en route to Tokio, where he will attend the sessions of the World Engineering Congress as an official delegate from Germany. After being engaged in practical engineering in various places for several years, he taught at Hildburghausen, a town in Thüringen, in middle Germany, and later in Cologne, where he was located from 1898 to 1906. He then became professor at the College of Engineering in Charlottenburg, and since 1909 has held the additional office of university lecturer of the history of science at the Technical University at Berlin. About the year 1901 Dr. Matschoss finished his first large book, entitled "Geschichte der Dampfmaschine" (History of the Steam Engine). He had always been deeply interested in history since his boyhood. This interest very naturally embraced the history of engineering and the lives of engineers, and his writings deal largely with these subjects. Dr. Matschoss has also taken a keen interest in educational matters and has contributed to the development of technical schools in Germany in various ways. In connection with this work he is business administrating director of the German Committee for Technical Education, founded in 1908.

Dr. Matschoss has been secretary of the Verein deutscher Ingenieure since 1916 and editor of the *Zeitschrift des Vereins deutscher Ingenieure* since 1924.

W. J. Bertke Heads Iowa Utilities

W. J. Bertke, for many years identified with Sioux City (Iowa) utilities and for the last few months vice-president and general manager of the Sioux City Gas & Electric Company, has been made president of the Iowa Public Service Company, Sioux City Gas & Electric Company and the Sioux City Service Company.

Mr. Bertke is a native of Milwaukee and a graduate of the University of Wisconsin in electrical engineering. He has been connected with the Sioux City properties since 1903 with the exception of two years, 1905-1907, which he spent in Kansas City as an employee of the Wyandotte County Gas Company. The Wyandotte Company and the Sioux City Company were associate companies under the United Gas Improvement Company of Philadelphia. Mr. Bertke started in 1903 as a cadet engineer and has progressed steadily through various departments to the presidency of the Iowa properties.

SAMUEL INSULL, president of the Commonwealth Edison Company, Chicago, returned from Europe this week aboard the North German Lloyd liner *Bremen*.

ELMER E. BARNARD, for fifteen years chief engineer for the Lynchburg Traction & Light Company and the Roanoke Railway & Electric Company, has severed his connection with those companies to open offices in Roanoke as a consulting engineer. Mr. Barnard is chairman of the state board of examiners for professional engineers, architects and land surveyors. Prior to his connection with the utility companies he was with the city engineering department of Lynchburg for ten years.

LESLIE T. CLAWSON for seven years identified with the sales department of the Puget Sound Power & Light Company in Seattle, Montesano and Olympia, Wash., has resigned to take charge of sales promotional work with Gordon-Prentice, Inc., distributor of General Electric refrigerators.

I. B. ADAMS, for the past twenty years manager of the Chico division of the Pacific Gas & Electric Company, has been appointed manager of the company's San Jose division, succeeding the late John D. Kuster. Mr. Adams has been associated with the gas and electric business in California for more than 30 years and in turn has been in the employ of the Yuba Electric Company, the Bay Counties Power Company, the Valley Counties Power Company and the California Gas & Electric Company, all predecessors of the Pacific Gas & Electric Company.

J. F. McLaughlin Named President of Richmond Utility

J. Frank McLaughlin, district manager of the Stone & Webster properties in Texas, Louisiana and New Mexico, has been named president of the Virginia Electric & Power Company, Richmond, to succeed William E. Wood, who has been assigned to new duties in New York. Until a year ago Mr. McLaughlin was operating vice-president of the Virginia Electric & Power Company, when he removed to Texas to take over Stone & Webster interests. He first went to Richmond in July, 1925, with Luke C. Bradley and William E. Wood, when President Bradley and Vice-President Wood assumed the management of the Virginia Electric & Power Company following the purchase of the controlling interest by Stone & Webster from the Frank Gould group of stockholders. Mr. McLaughlin was in charge of operations in Norfolk before going to Richmond. He will also serve on the directorate of the Richmond utility.

DR. BERNARD HAGUE, principal lecturer in electrical engineering at the University of Glasgow, Scotland, has accepted the invitation of the Polytechnic Institute of Brooklyn to serve as visiting professor of electrical engineering at Polytechnic for the present academic year. Dr. Hague, who has degrees from the Universities of London and Glasgow, is the holder of the Siemens medal for electrical engineering and the Henrici medal for mathematics, as well as the diploma of the Imperial College of Science for post-graduate research. He is a member of the Institution of Electrical Engineers and the author of several standard works on electrical subjects.

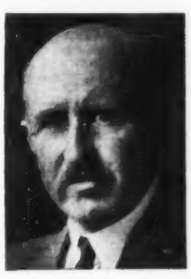
Obituary

David Lynde Huntington

David Lynde Huntington, president of the Washington Water Power Company, Spokane, since 1910, and prominently identified with the electrical development of the Northwest, died at his home in that city September 27. He had been confined to his home for the past two years, although during the greater part of that time he was able to devote some attention to company affairs. Mr. Huntington was an important factor in the growth of the Spokane utility and it was largely through his vision and guidance, in association with the late Henry M. Richards, the preceding president, that the company has reached its present position. The last big undertaking of Mr. Huntington as active head of the Washington Water Power Company was the building of the Chelan hydroelectric plant, in connection with which project he made several trips to New York and personally supervised the details of the purchase of the site, the award of contracts and the financial program formulated to see the enterprise through. Although he became ill before the work was completed he kept in touch with its progress, and it was he who pressed the electric button from his sickroom that placed the first unit in service.

Mr. Huntington entered the employ of the Washington Water Power Company in the capacity of treasurer in 1894. He was made assistant secretary in 1895, in less than a year became general manager, and in 1903 was appointed second vice-president and general manager. It was in 1910 that he assumed his executive duties as active president of the company and affiliated properties. In addition he had been president of the Spokane United Railways since that company was formed July 1, 1922.

Mr. Huntington was born in New London, Conn., and received his education in the public schools of Washington, D. C., and at Yale University. After leaving Yale he joined the Thomson-Houston Electric Company, Lynn, Mass., and following the organization of the General Electric Company he was sent to the Philadelphia district, where he engaged in various kinds of work ranging from the selling of appliances to the building of pole lines and power plants. He resigned to become treasurer of the Washington Water Power Company. He was active in the National Electric Light Association and other engineering societies and was a fellow of the American Institute of Electrical Engineers.



In commenting on the death of Mr. Huntington editorially the *Spokesman-Review*, a local paper, said: "The amazing development of the company he headed testifies eloquently to his capabilities in his chosen field. That development was not alone the result of his technical appreciation of engineering problems and his ability to cope with them, but to an even greater extent it was due to his early recognition that a public utility stood or fell according as it served its territory efficiently or failed to do so. Mr. Huntington might be said to have anticipated the public policy, now the rule rather than the exception among public utility corporations of foresight and aggressiveness, that service is the yardstick that measures their usefulness."

EDWARD L. MCKEE, at one time president of the Merchants Heat & Light Company of Indianapolis, now merged into the Indianapolis Power & Light Company, died recently at his home in that city.

J. D. BLACKWELL, for two years city engineer of Seattle, died suddenly at his home in that city on September 5, at the age of 59 years. Mr. Blackwell had been engaged in engineering work in Seattle for twenty years and was a former president of the Northwest Society of Engineers.

JOHN D. KUSTER, for a number of years division manager of the Pacific Gas & Electric Company with headquarters in San Jose, Calif., died of pneumonia September 12, following a week's illness. Mr. Kuster had been associated with the Pacific Gas & Electric Company for many years, having served as its district manager in Colusa and Fresno prior to his becoming district manager at San Jose in 1909. Later he was made division manager of the San Jose district.

STEWART W. POWELL, 31 years old, an employee in the line trouble department of the Louisville Gas & Electric Company, was electrocuted September 27 while working on a power line at Middletown, on the Shelbyville Road. William Rakestraw, driver of a Maypole ambulance, administered artificial respiration for forty-five minutes but was unable to revive Mr. Powell. The wire with which he came in contact carried 10,000 volts. Mr. Powell, who had been employed by the company since 1926, received the Insull medal October 24, 1928, for saving the life of a fellow employee March 12, 1928. He was also credited with having saved the life of another lineman June 18 on the Shelbyville Road.

PROF. GEORGE A. GOODENOUGH, well-known scientist of the University of Illinois, died suddenly, at his home in Urbana September 29, the victim of a heart attack. Professor Goodenough was 61 years of age. He had been professor of thermodynamics at the University of Illinois since 1911 and was the author of several standard textbooks. Professor Goodenough was a native of Davison, Mich. He received the degree of bachelor of science from Michigan Agricultural College in 1891 and did post-graduate work at the University of Michigan and the University of Illinois. The degree of master of engineering was conferred on him at the latter institution in 1900. Before joining the faculty of the University of Illinois as instructor in mechanical engineering he taught at the Michigan Agricultural College. He was a member of the Society for the Promotion of Engineering Education and of the American Society of Mechanical Engineers.

Financial and Statistical News

THE WEEK'S orderly but persistent selling movement has swept prices of a dozen big board utility stocks down 23 points on the average (to October 2) from their high marks for the year. The utilities bore the brunt of a good deal of the selling, having enjoyed the most rapid and extensive rise prior to the selling operations.

——STOCKS THAT SUFFERED THE HEAVIEST DECLINE from the year's tops include Consolidated Gas of New York and American & Foreign Power. Higher priced stocks, like Commonwealth Edison and Middle West Utilities, sold off more than 100 points from the year's high marks.

——INVESTMENT TRUSTS WHICH HAVE HAD LARGE AMOUNTS ON CALL are rumored to be stepping into the market to take advantage of current prices.

Cities Service to Issue Rights

At a special meeting of the board of directors of the Cities Service Company it was decided to offer the 215,000 holders of the common stock of the company an opportunity to purchase additional common shares. The price at which the new stock will be offered, the ratio of rights to shares owned and the date before which the rights must be exercised are to be determined at a special meeting of the board called for October 10. There are now outstanding 22,270,544 shares of no-par common stock of an authorized issue of 50,000,000 shares. Stockholders of the company received rights last January to buy additional old shares at $65 a share.

Electric Bond & Share to Increase Stock

Stockholders of the Electric Bond & Share Company will be asked to approve an increase in the authorized capital stock from 14,500,000 to 23,500,000 shares at their annual meeting on October 9. The increase will facilitate the acquisition of Electric Investors, Inc., through the offering of eight Electric Bond & Share common shares for each five Electric Investors, and a share-for-share exchange of $6 preferred stocks. The authorized common stock will be increased from 12,500,000 shares to 20,000,000 shares and the $6 preferred stock from 1,000,000 to 2,500,000 shares, while the $5 preferred stock will remain at 1,000,000 shares.

Portland Electric Merger Terms Announced

Holders of each ten common shares of the Portland Electric Power Company have received offers of the choice of $800 in cash or twenty-two shares of common stock of the Public Utility Holding Corporation of America, it was announced by the Harris-Forbes, American Founders and United Founders group, which recently acquired a controlling interest in the Oregon company from the E. W. Clark interests of Philadelphia.

To the holders of each ten shares of 6 per cent non-cumulative second preferred stock of the Portland company are offered $900 in cash or twenty-four shares of common stock of the Public Utility Holding Corporation of America, at the option of stockholders, and to the holders of each ten shares of 7 per cent prior preference stock of the Portland company are offered twenty-eight shares of common stock of the Public Utility Holding Corporation. Fifty cents a share will be deducted from the price paid for stock sold for cash for expenses and compensation. No allowance will be made for dividends accrued on either of the preferred stocks.

The offer includes the purchase of shares of stock of the Portland company in less than ten-share lots, but the Public Utility Holding Corporation will be under no obligation to deliver certificates for any fractional shares or warrants, but will deliver in lieu thereof scrip certificates expiring on Nov. 15, 1934, which may be combined with other similar scrip certificates and exchanged for one or more whole shares and warrants.

SIERRA PACIFIC ELECTRIC TO CHANGE PAR VALUE OF STOCK.—Stockholders of the Sierra Pacific Electric Company will vote on October 11 on changing the par value of the common stock from $100 to no-par value and increasing the number of authorized shares from 80,000 to 150,000 shares.

Columbia Gas Announces Stock Dividend

The board of directors of the Columbia Gas & Electric Corporation adopted a resolution declaring the advisability of increasing the authorized common stock without par value from 10,000,000 shares to 30,000,000 shares. A special meeting of shareholders has been called to be held at Wilmington, Del., Nov. 6, for the purpose of authorizing an amendment to the certificate of incorporation to effect such increase.

The purpose of the proposed increase is to provide for the corporate needs of the corporation. After favorable action by the shareholders authorizing this increase, recommendation will be made to the board of directors for the use of a

Consolidation of Control Necessary but Misunderstood*

"CONSOLIDATION of control, whether expressed in the actual merging of companies or in the gathering of several companies into one large system, presents a major problem. On the one hand, it is without question the only method whereby the industry can continue to render at a reasonable price to the public the kind of service that the public has come to expect and demand. On the other hand, this very procedure of assembling the industry into large corporate units carries with it the extremely real danger that the public will not comprehend the economic necessity behind the movement and will develop an attitude of suspicion and distrust that will endanger the success of these large enterprises.

Evidence that this feeling of suspicion is developing is not hard to find. We have seen it reflected in the agitation that resulted in the Federal Trade Commission investigation; each merger brings with it a volume of editorial comment that, if not wholly unfriendly, at least indicates clearly a disposition to impugn the motives of those responsible for the merger.

"Not all of this can be laid at the door of those who attack the industry in their capacity of professional demagogues and of those others who seek to nationalize the industry. A large part of it reflects an attitude of bewilderment and misunderstanding which is too often the result of ignorance."

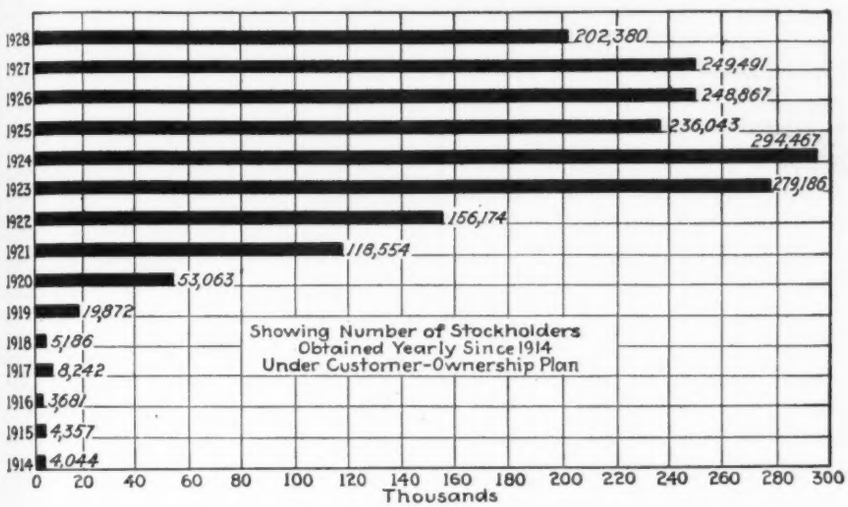
**From address before convention Empire State Gas and Electric Association, September 19, by Charles S. Ruffner, president.*

part of the additional stock in the declaration of a 25 per cent dividend on the common stock, payable in common stock after Feb. 15, 1930, which will entitle the holders thereof to the May dividend; the holders of the outstanding subscription receipts of the corporation to be entitled to this dividend in respect to the stock received by them upon completion of their subscriptions.

Decline Was Anticipated in Customer-Ownership Sales

THE recent falling off in customer-ownership sales in the power and light industry was not unexpected, according to the recently published report of the customer-ownership committee of the National Electric Light Association, of which J. E. Shute is chairman. According to the 1928-29 report of the committee, "Decreasing activities during 1928 were anticipated, and it is believed do not indicate any real loss of interest in customer ownership on the part of electric light and power companies. The results of the year seem merely to reflect the general conditions bearing upon financing of capital requirements. These requirements, to a larger degree than formerly, were supplied by the sale of common stock. The popularity of electric light and power securities in general, to which customer-ownership activities in past years contributed in no small degree, together with the increasing demand of the public for common-stock investments, brought about a period which dictated the wisdom of a larger proportion of financing by means of common-stock issues. This period followed one whereby a large part of financing requirements were most advantageously handled by bond issues. Because of these facts, it was inevitable that the amount of preferred stock which could be issued and at the same time preserve well-balanced financial structures, enabling the ingress of capital on the lowest average terms, was curtailed. Inasmuch as the majority of companies have retained a policy of restricting customer-ownership distribution of preferred stock, the effect upon this particular form of financing is obvious."

The committee on customer ownership indicates that it is not in a position to offer any panacea for the decline in customer-ownership activity, but it feels that there are certain features about customer-ownership financing in Pennsylvania especially which merit consideration from a purely state standpoint. Some of these follow:



Customer-Ownership Sales Reached Their Peak in 1924

1. In Pennsylvania the legal rate of interest has been set at 6 per cent. This rate has been in existence for so long that it has become to a large extent a tradition with the investors of the state. Many investors feel that they are entitled to at least 6 per cent on their investment. It may sound rather extreme, but there are plenty of people who will not buy securities yielding a fraction of a cent less than 6 per cent, but at 6 per cent are keenly interested in a security.

2. We think that the companies should be generous with warrant privileges or rights when offering a new issue of stock, and that a market should be provided for warrants and rights when the shareholders are unable to exercise their privilege. Warrants and rights are construed by shareholders as an additional income, or extra dividend, and they tend to maintain a demand at all times for preferred shares.

3. We are also of the opinion that investment departments should be created where utility companies sell preferred stock to their customers, in order to handle rights or warrants to which these shareholders may be entitled. A department of this kind is in a position to protect the interest of the shareholders and to secure for them the maximum market price for warrants or rights.

4. We are convinced that a good resale market should be available at all times for preferred stock, if an interest in customer-ownership is to be maintained or increased. Many shareholders are not familiar with operations of brokers and stock exchange practices, consequently the initiative in affording a free resale market for securities offered by companies should be maintained by the investment department or some other department of the company delegated to handle this work.

5. We believe the time is rapidly approaching when any new financing of preferred stock will necessitate the incorporation of certain conversion privileges into common stock of companies. This tendency has been evident to some degree in the recent financing of some of the electric light and power companies. Practically all cases of the issue of preferred stock with common stock conversion privileges have been oversubscribed before the opening date, or it was oversubscribed within a few hours or days after announcement of the stock issue was published.

Central-Station Output Is 73 per Cent of Total

The total output of electrical energy in the United States (not including outlying possessions) in 1927 amounted to 102,759,753,811 kw.-hr., according to an announcement by the Department of Commerce based on data collected at the quinquennial census of electrical industries and the biennial census of manufactures taken in 1928. Of this total 74,686,378,010 kw.-hr., or 72.7 per cent, came from central electric light and power stations; the distribution of the remainder is shown in the table, which also shows the generator rating by groups. Both active and reserve equipment are included.

The leading states in respect of output were: New York, with 13,852,904,969 kw.-hr.; Pennsylvania, 11,870,182,911 kw.-hr.; Illinois, 7,596,283,632 kw.-hr.; California, 7,428,776,729 kw.-hr.;

Electric Plants and Output in the United States, 1927

	Generators			Energy Generated	
	Number	Rated Capacity, Kw.	Per Cent of Total	Kw.-Hr.	Per Cent of Total
United States, total	*35,338*	*36,275,001*	*100.0*	*102,759,753,811*	*100.0*
Central electric light and power stations	11,967	25,811,305	71.1	74,686,378,010	72.7
Electric railways	419	1,470,904	4.1	2,975,863,293	2.9
Electrified divisions of steam railroads	64	358,335	1.0	844,780,315	0.8
Manufacturing establishments	19,028	7,345,685	20.3	20,558,426,000(a)	20.0
Isolated plants (b)	3,860	1,288,772	3.5	3,694,306,193	3.6

(a) Estimated in part. See text.
(b) Mines and quarries, hotels, amusement parks, apartment houses, theaters, office buildings, etc., which operated generators of 100 kw. capacity or more.

Ohio, 7,244,404,198 kw.-hr., and Michigan, 5,789,716,408 kw.-hr. These six states together reported 53,782,268,847, or 52.3 per cent of the total, and no other state reported as much as 3,500,000,000 kw.-hr.

According to the announcement, the returns from manufacturing establishments were substantially complete in respect of number and capacity of generators, but were incomplete in regard to output. The generator capacity reported by the establishments whose returns were complete amounted to a little more than 80 per cent of the generator capacity for all manufacturing establishments. It became necessary, therefore, to estimate the output for the remainder. This was done on the assumption of equal output per kilowatt of rated capacity. The estimated part of the output of manufacturing establishments amounts to approximately 4,000,000,000 kw.-hr., or only about 4 per cent of the aggregate reported by all classes of establishments.

In addition to the generators in use in public utility and manufacturing establishments, a considerable number are operated by mines and quarries, hotels, amusement parks and other enterprises, principally for the purpose of generating current for their own use. In some cases establishments of this kind, such as mines, sell current, and where the quantity sold is sufficient to bring the establishment under the control of the public utilities commission, according to the laws of the state in which located, the data are included in the figures for central electric light and power stations. The statistics for "isolated" plants refer, therefore, to generators of 100-kw. capacity or more which are not operated for the commercial production of electric current.

Financial Briefs

Cleveland Electric Illuminating Company directors have declared a quarterly dividend of 40 cents on common, payable October 1 to holders of record September 20.

Penn-Ohio Edison Company has declared a dividend of 50 cents on the common stock, payable November 1 to stock of record October 15.

Northeastern Power Company has paid an extra dividend of 75 cents on the regular quarterly dividend of 25 cents.

Hartford Electric Light Company has given its stockholders of record August 15 the right to subscribe on or before October 22 for 120,000 additional shares of capital stock at par ($25 per share) on a one-for-six basis.

International Superpower Corporation stockholders at a special meeting in Baltimore approved the board of directors' proposal to increase the authorized capital stock to 2,000,000 no-par shares, from 500,000 shares.

Utility Offerings in 1929 Total $767,135,000

SEPTEMBER brought to a close the third quarter of 1929 with new electric light and power public utility financing totaling $183,735,000, as compared with $167,219,500 during the second quarter of the year. To this total the month of September alone contributed $102,555,000, the largest monthly total recorded since March. In the course of the nine-month period the utility companies floated new offerings of stocks, bonds and notes to the amount of $767,135,000, against $961,053,352 in the similar period of 1928.

Although these figures giving comparisons are interesting, showing as they do how monthly totals vary, of much greater significance is the change in the character of the new offerings. Attention is called to the prominent part taken by common-stock offerings, which seem to have caught the public eye and held its attention to the disadvantage of the bond market. Many of the offerings of bonds and notes that are being issued at the present time are being accompanied by additional inducements in the way of conversion privileges, subscription rights or warrants. This is also true of preferred stock issues. The accompanying tabulation, covering the new security issues of electric service companies during the month of September, is evidence of this characteristic of the present market. The average yield was 5.63 per cent.

New Security Issues of Electric Service Companies in September

Name of Company	Amount of Issue (Par Value)	Period, Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Midland United Co.	$7,350,000	..	Common stock	To further construction program of subsidiaries and for other corporate purposes	..	35	....
Central States Electric Corp.	25,000,000	25	Optional debentures (with common stock purchase warrants)		5½	99½	5.53
General Gas & Electric Corp.	14,850,000	..	Cumulative convertible preferred stock, series B		6	99	6.06
Iowa Public Service Co.	1,300,000	30	First mortgage gold bonds	To reimburse treasury for money expended for acquisition of new properties, for additions and extensions and for other corporate purposes	5½	97	5.70
Empire Corporation	2,900,000	..	Allotment certificates		..	58	....
City of Seattle (Washington) Municipal Light and Power Plant and System	2,000,000	6-30 yrs.	Gold bonds	Additions, betterments and extensions	5	96 to 98¾	5.25
Federal Public Service Corp.	4,000,000	3	Convertible gold notes	To finance recent acquisition of additional subsidiaries	6	97½	7
Mid-West States Utilities Co.	1,200,000	2	Convertible gold notes	Acquisition of properties, for property improvements and for other corporate purposes	6	100	6
Keystone Water Works & Electric Corp.	1,305,000	..	Class A stock		..	43½	....
Missouri Valley Public Service Co.	700,000	10	First lien gold bonds, series A	To retire maturing obligations, for the acquisition of additional properties and for other corporate purposes	6 5	96¾ 98	6.45 7.10
	500,000	1	Gold notes				
Northern Indiana Public Service Co.	15,500,000	40	First and refunding mortgage gold bonds, series D	To reimburse the company for capital expenditures heretofore made, for the expansion of the company's general service and for other corporate purposes	5	94	5.37
Tri-Utilities Corp.	12,500,000	50	Convertible gold debentures	To acquire securities of other companies, to provide funds for investment and for other corporate purposes	5	99	5.05
West Penn Power Co.	9,000,000	..	Cumulative preferred stock	Additions, extensions and improvements made to the properties of the company and for other corporate purposes	6	102	5.88
Central Vermont Public Service Corp.	4,450,000	30	First and refunding mortgage gold bonds, series A	Acquisition of constituent companies, the retirement of certain bonds and the reimbursement of the company's treasury for the extension of plant and equipment already completed and for other corporate purposes	5	96	5.25

Total $102,555,000
Total amount actually realized $101,046,750
Rights $117,034,438
Total financing for September $218,081,188

Business News and Market Conditions

Unusual Displays Planned for Electrical Show

The exhibit committee of the Electrical Board of Trade and the New York Electrical League has completed preparations for the big Electrical Show next week. The exposition is to be held in Grand Central Palace, New York, October 7 to 12. Formal opening will take place Monday afternoon, October 7, although the exposition will be open from 10 in the morning until 2 in the afternoon for representatives of the trade. During the exposition the doors open at 10 in the morning and at 11 a nationally known speaker will address those in attendance.

Displays will include an educational exhibit depicting the history of light from the use of torches to the use of the incandescent lamp. The display will include a model of the laboratory at Menlo Park, where Edison performed most of his experiments on the incandescent lamp. There will also be an exhibit of the working model of the first generating station at Pearl Street and four models of the large generating plants that now help to supply the metropolitan area with electrical energy.

Canada's Electrical Goods

Production from the electrical apparatus and supplies industry in Canada was valued at $93,672,452 in 1928, according to a government statement just issued. This figure was the highest total ever reported for the industry, and was 19 per cent over the value of $78,558,730 for the previous year. Substantial increases in the output of electrical supplies have been made during recent years. In 1924 reports showed a gain of $5,000,000 over the preceding year; in 1925 a further advance of $4,000,000 was reported, and gains of $9,000,000 in 1926 and nearly $9,000,000 in 1927 were noted.

Copper Sales Decline

Copper sales totaled only slightly more than the moderate business reported a week ago. So little interest has recently been exhibited that the larger producers are reverting to their former policy of turning most of the business over to the custom smelters, who have thus been enabled to book a normal amount of orders. The price is unchanged at 18 cents for Connecticut deliveries and 18⅛ cents in the Middle West, with about half of the business for prompt or October shipment.

New York Metal Market Prices

	Sept. 25, 1929 Cents per Pound	Oct. 2, 1929 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S. & R. price	6.90	6.90
Antimony	8.75	8.50
Nickel, ingot	35	35
Zinc, spot	7.15	7.15
Tin, Straits	42.12	43.65
Aluminum, 99 per cent.	24.30	24.30

Electrical Exports (Preliminary) Department of Commerce

Article	July 1928	July 1929
Generators:		
Direct-current—		
Under 500 kilowatts	115,100	137,435
500 kilowatts and over	75,039	6,000
Alternating current—		
Under 2,000 kva.	39,807	42,675
2,000 kva. and over	.....	71,032
Steam turbine generator sets	117,224	75,957
Accessories and parts for generators	110,754	72,877
Self-contained lighting outfits	103,489	96,866
Batteries:		
Flashlight batteries	198,534	211,591
Other dry and wet cell —primary batteries	222,568	.....
Radio B and C batteries (dry)	.....	77,698
Other, not elsewhere specified	.....	148,919
Storage batteries	319,324	254,020
Transforming or converting apparatus:		
Power transformers, 500 kva. and over	124,051	226,898
Distribution transformers, less than 500 kva.	71,402	135,674
Instrument transformers	1,109	11,276
Other transformers, not elsewhere specified	71,257	86,431
Complete battery chargers under 15 amperes	27,229	19,736
Rectifiers, double-current and motor generators, dynamotors, synchronous and other converters	65,597	102,249
Transmission and distribution apparatus:		
Switchboard panels, except telephone	258,509	64,485
Switches and circuit breakers over 10 amp.	180,188	155,509
Fuses and fuse blocks	40,847	37,980
Watt-hour and other measuring meters	96,463	88,497
Electrical indicating instruments	41,006	74,606
Electrical recording instruments	23,368	44,883
Other electrical testing apparatus	67,357	99,946
Lightning arresters, choke coils, reactors, and other protective devices	107,628	43,821
Motors, starters, and controllers:		
Motors, ¼ hp. and under	193,572	246,238
Motors, over ¼ and under 1 hp.	71,738	66,356
Stationary motors—		
1 to 200 hp.	198,532	449,585
Over 200 hp.	52,112	39,813
Railway motors	10,179	49,815
Electric locomotives—		
Railway	.....	67,992
Mining and industrial	36,382	53,111
Station and warehouse electric motor trucks	18,807	16,439
Starting and controlling equipment—		
For industrial motors	99,717	159,937
For electric railway and vehicle motors	20,826	6,759
Portable electric tools	127,107	.....
Portable electric tools, except automotive	.....	135,443
Automotive electric machine tools	.....	13,901
Accessories and parts for motors	277,983	320,679
Electric appliances:		
Electric fans	97,569	88,301
Electric lamps—		
Metal filament	144,723	97,035
Other electric lamps	49,490	61,637
Flashlights	208,349	210,211
Searchlights and projectors	58,827	47,057
Motor-driven household devices—		
Electric household washing machines	188,794	176,326
Elec. vacuum cleaners	124,095	166,218
Other motor-driven devices, except tools	67,372	93,255
Electric flatirons	26 161	34,865
Electric cooking ranges	16,862	35,579
Other domestic heating and cooking devices	76,536	76,445
Industrial electric furnaces and ovens	74,496	59,769
Therapeutic apparatus, x-ray machines, galvanic and faradic batteries, etc	165,022	158,924
Signal and communication devices:		
Radio apparatus—		
Transmitting sets and parts	21,361	121,095
Receiving sets	377,087	767,394
Tubes	84,759	138,440
Receiving set components	205,020	369,013
Other receiving-set accessories	260,204	.....
Loudspeakers	.....	185,675
Other receiving-set accessories, not elsewhere specified	.....	205,725
Telegraph apparatus	62,737	103,881
Telephone apparatus—		
Telephone instruments	30,571	119,016
Telephone switchboards	30,244	83,105
Other telephone equipment	187,067	413,063
Railway signals, switches and attachments	65,904	170,077
Bells, buzzers, annunciators and alarms	17,845	27,064
Other electric apparatus:		
Spark plugs	139,865	198,632
Other starting, lighting, and ignition equipment	124,740	136,811
Insulating material	131,851	178,412
Metal conduit, outlet, and switch boxes	115,414	136,931
Sockets, receptacles and lighting switches	155,628	168,499
Electric interior lighting fixtures	175,658	217,686
Electric street lighting fixtures	19,912	56,264
Other wiring supplies and line material	88,642	119,228
Other electrical apparatus not elsewhere specified	805,398	1,197,243
Rubber and friction tape	49,792	47,149
Globes and shades for lighting fixtures	54,236	62,936
Electrical glassware except for lighting	31,379	25,888
Electrical porcelain:		
For less than 6,600 volts	55,661	60,102
For 6,600 volts and over	41,836	38,935
Carbons, carbon brushes, and electrodes:		
Electrodes for electric furnaces	148,793	127,814
Other carbon products	53,429	76,211
Insulated wire and cable, iron or steel	22,517	21,371
Copper, bare wire	509,216	308,379
Copper, insulated wire and cable	394,373	504,612
Refrigeration sets up to 1 ton capacity	575,748	.....
Refrigeration sets up to ¼ ton capacity	.....	1,020,891
Refrigeration sets over ¼ to 1 ton capacity	.....	165,655
Totals	$9,919,988	$12,891,948

Market Conditions

ELECTRIC TRAIN CONTROL APPARATUS has been a feature in the Eastern district, in the electrical equipment business, and a large volume of electric railway business is anticipated.

——CENTRAL-STATION DEMAND has been active in the Middle West and Southwest.

——HEAVY MACHINERY PURCHASES WERE A FEATURE on the Pacific Coast. Motor sales are active in the Puget Sound area.

EASTERN

ELECTRIC RAILWAY account continues as a primary point of interest in the Eastern district and heavy commitments are going forward in this line. Central station business is gaining in strength and inquiries give promise of early sizable orders, particularly for substation equipment; demand for high-tension line apparatus is improving. Industrial call holds on a good basis, with orders scattered among a variety of industries. Marine equipment is quiet.

Following a recent order for 35 oil-electric switching locomotives, as reported in these columns, the New York Central Railroad Company has placed a contract for 42 electric locomotives with the American Locomotive Company and General Electric Company, to cost $5,000,000, making a total of $9,000,000 invested by the road in units of this type within the past month, and establishing a record commitment. A manufacturer of electric railway equipment says that there is a large volume of business in sight of varied character. Electric train control apparatus is sharing in the demand and a $311,000 contract has been secured by the Union Switch & Signal Company for an installation for the Northern Division of the Chicago, Indianapolis & Louisville Railroad. A plant devoted to railway equipment in the Chicago district has adopted a night-working schedule in several departments.

Central stations are placing a good quota of orders for fall delivery. A power company in Indiana has contracted with a New York manufacturer for transformer and switchgear to cost $30,000. Another power interest in northern New York has closed for a number of transformer units to cost $60,000. A metropolitan central station has ordered a quantity of network protectors to an amount of $180,000. A manufacturer of switchgear says that business is very brisk for heavy-duty apparatus for outdoor service for utility companies and railroads. The Pacific Gas & Electric Company has contracted with a Pennsylvania maker for generating equipment for two new stations, costing about $400,000. In connection with industrial demand, radio station work is calling for a sizable quantity of equipment and a manufacturer of generator sets for this purpose has just received an order totaling $75,000. Iron and steel mills are continuing as active factors in the market, with a strong demand for industrial motors of heavy-duty type and control apparatus. Strength is also shown in commitments from the chemical industry, textile mills, machine tool manufacturers, and paper mills. A maker of air compressors in New England has ordered a quantity of motors and controls from a New York manufacturer, to cost about $30,000. A producer of wire and cable reports trade as generally good, with a considerable volume of small orders. Oil burner manufacturers are in the market for fractional-horsepower motors and commitments are growing for this account. Airport lighting equipment continues an upward trend and the outlook for the fall and winter months is excellent. Heating and cooking appliances for domestic service are quiet. Construction projects follow:

Buffalo, Niagara & Hudson Power Corporation, Buffalo, N. Y., plans a steam-operated electric power plant of 100,000 hp. capacity. Houde Engineering Corporation, Buffalo, plans extensions in automobile shock absorber plant to cost $200,000. Mount Vernon, N. Y., will build a municipal automobile service, repair and garage building to cost $105,000. Continental Pipe & Mining Company, New York, will take bids within 30 to 60 days for a pipe-manufacturing plant at Boston, Mass., to cost $2,000,000. Buffalo Slag Company, Buffalo, N. Y., will soon begin construction of a crushing plant to cost more than $300,000. Foster-Wheeler Corporation, New York, will build an addition to its condenser and other power equipment manufacturing plant at Carteret, N. J. Matawan Tile Company, Matawan, N. J., is completing plans for rebuilding of portion of plant recently destroyed by fire with loss of $100,000. New York Belting & Packing Company, New York, will build an addition to plant at Passaic, N. J., to cost about $200,000. F. G. Vogt & Sons, Inc., Philadelphia, Pa., will build a meat-packing plant to cost $1,000,000, and will soon ask bids. Standard Oil Company of Pennsylvania, Inc., Philadelphia, will build an oil storage and distributing plant at Lancaster, Pa., to cost $150,000. The Chamber of Commerce, Wilmington, Del., plans installation of lighting equipment at the municipal airport, Bellanca Field. Bethlehem Steel Company, Baltimore, Md., will build an addition to cost more than $500,000. Davison Chemical Company, Baltimore, plans a fertilizer plant at Houston, Tex., to cost about $1,000,000. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until October 22 for eight switchboards and spares for the Mare Island and Puget Sound navy yards (Schedule 1891); at the same time, for one frequency changer set for the Mare Island yard (Schedule 1864). Bureau of Yards and Docks, Navy Department, Washington, will receive bids (no closing date stated) for electric generators and instruments for the naval ammunition depot at Iona Island, N. Y. (Specification 6024); also, bids (no closing date stated) for electric and telephone transmission lines, conductor cables and accessories, for the naval ammunition depot at Hawthorne, Nev. (Specification 6016).

SOUTHEAST

SATISFACTORILY sustained business in the central-station field but slightly slackened activities in the industrial are reported for the Southeast. Retail trade has been considerably slowed up by heavy rains and storms over the territory.

A Tennessee power company ordered last week arrester and metering equipment aggregating $50,000 for installation on the tie line to Muscle Shoals being constructed, and other business in this connection is pending. Power and blow-off valves totaling $37,000 in amount were ordered for the Atkinson steam plant in Atlanta. One power company's switching equipment orders in the past ten days have totaled $21,000 and its transformer orders $14,500. A Georgia company ordered $9,500 in miscellaneous substation equipment, while a North Carolina company ordered $5,200 in power transformers. A power transformer order approximating $7,000 is in prospect from a Florida company. The city of Atlanta has recently let contracts for three extensions to its "white-way" system, the electrical materials and standards involving $16,000, $4,200 and $3,500, respectively. Contract for another extension, which will involve $16,000 for standards and cables, will be let within the next two weeks. An order was placed last week for $20,000 in lighting fixtures for the new street-lighting project at New Orleans. Construction projects follow:

Fairmont Mining Machinery Company, Fairmont, W. Va., plans extensions and improvements in plant to cost $100,000. Kentucky Utilities Company, Louisville, Ky., plans transmission line from Lexington to Maysville, about 60 miles, to operate at 66,000 volts. Pritchett-Thomas Company, Nashville, Tenn., has filed plans for a six-story automobile, service, repair and garage building to cost $500,000. Carolina-Virginia Power Company, Roanoke Rapids, N. C., contemplates hydro-electric power plant on the Roanoke River with capacity of 30,000 hp. to cost close to $1,000,000, with transmission system. Oak City Laundry Company, Raleigh, N. C., plans electric power plant and complete electrification of laundry, reported to cost more than $75,000. Birmingham, Ala., plans extensions in street-lighting system. Alabama Power Company, Birmingham, Ala., will make extensions and improvements in substations and transmission lines in vicin-

ity of Gadsden, Ala., to cost $500,000. Savannah, Ga., is reported planning installation of airport lighting system in connection with improvement program to cost $250,000. Georgia Power Company, Atlanta, Ga., plans hydro-electric power plant on Oconee River, reported to cost about $1,000,000, with transmission lines.

New England

SALES of small motors were active in this territory during the past week. Small switch and power control orders were active; general scheduled materials were in good demand and the movement was reported very encouraging. Resumption of activity in textile mills and a better outlook in leather industries are given as one reason for a promising trend in buying of electrical supplies in this district.

Central station requirements were somewhat spotty; transformer sales are better than a few weeks ago; outside pole line materials are less active; manufacturers of industrial electric furnaces report an encouraging season ahead; orders which will total over $50,000 are pending for a number of furnaces which will be used in heat treatment of steel. Steady demand for small heating furnaces and pot types are noted. Negotiations for heavy electrical machinery are under way. Reorganizations and additions to industrial power plants in this district are active. Refrigerators are in demand; an order for over 1,000 was placed by one district distributor; domestic appliances are attracting interest. New Bedford Gas & Electric Company is planning to increase its steam power plant and will expend about $1,500,000. Construction projects follow:

Edison Electric Illuminating Company, Boston, Mass., will build a power substation at Woburn to cost about $100,000. New England Power Company, Worcester, Mass., plans transmission line to connect with power development at Fifteen-Mile Falls, N. H., to cost $360,000. New Bedford, Mass., will soon take bids for a vocational school to cost $225,000.

Middle West

BUSINESS in the Middle West section continues on a satisfactory basis. Evidence of sustained prosperity is noted from various sources with every prospect for a successful close of third quarter business. Reports emanating from railroad sources indicate a volume movement of commodities, while railroad purchasing of equipment has been unusually gratifying.

The various utility companies are very busy, bending every effort toward the completion of a major portion of the outstanding construction before cold weather arrives. The demand for major apparatus has been somewhat limited, although general requirements purchasing has been quite heavy, one large utility averaging $85,000 a day. One interesting order placed this week was for one carload of "Copperweld" guy wire.

Jobbers' sales are increasing with a general betterment of business. A slight revival of building activity, together with railroad and municipal business, has helped jobbers' sales considerably. The electrical exposition held in the electric shops of the Commonwealth Edison Company, Chicago, has stimulated interest in electrical appliances, with a resultant gain in sales. Construction projects follow:

Silent Automatic Corporation, Detroit, Mich., will build addition to oil burner manufacturing plant to cost $300,000. Chicago Rolling Mills, Inc., Chicago, Ill., will establish a plant to cost $1,000,000. Bendix Aviation Corporation, South Bend, Ind., will build an addition to aircraft equipment plant to cost about $800,000. Hartford City, Ind., plans a vocational school to cost $100,000. Dayton Airplane Engine Company, Dayton, Ohio, plans an addition to cost $500,000. University of Cincinnati, Cincinnati, Ohio, plans addition to power plant to cost $40,000. Western Paper Goods Company, Cincinnati, Ohio, plans plant to cost $250,000. Metal Aircraft Corporation, Cincinnati, Ohio, plans an addition to cost more than $85,000.

Dauntless Coal Company, Crooksville, Ohio, plans extensions and improvements to cost more than $40,000. Ohio Power Company, Newark, Ohio, will soon begin construction of an addition to power substation at Spencerville, Ohio. Akron *Times-Press*, Akron, Ohio, plans printing plant to cost about $750,000. Barker Baking & Candy Company, Bismarck, N. D., will proceed with a baking plant to cost $140,000. Wilmot, S. D., will soon take bids for an ornamental lighting system. Minnesota Steel Company, Duluth, Minn., will build an addition to cost about $100,000. St. Paul, Minn., plans installation of ornamental lighting system. Twin City Milk Producers' Association, Minneapolis, Minn., will build a plant at Farmington, Minn., to cost $100,000. Iowa Southern Utilities Company, Centerville, Iowa, will proceed with addition to power plant at Ottumwa, Iowa, to cost $250,000.

Southwest

CENTRAL-STATION buying in the St. Louis district continues steady. Manufacturers are figuring on some large installations and specifications are being prepared for other good-sized jobs. The demand for poles and other line construction supplies still is good.

Contracts reported closed are for a 400-kw. turbo-generator specially designed to use exhaust for steam heating to cost $12,000, a lot of oil circuit breakers and two banks of transformers for new factories in the southern part of the district costing $3,500 each. Construction projects follow:

Ryan Aircraft Corporation, St. Louis, Mo., plans airplane manufacturing plant to cost $100,000. St. Luke's Hospital, St. Louis, Mo., will build a power plant to cost about $100,000. Galt, Mo., has approved plans for a municipal electric light and power plant. Woods Brothers, Inc., Kansas City, Mo., plan aircraft manufacturing plant at St. Joseph, Mo., to cost about $60,000. Capper Publications, Inc., Topeka, Kan., plans printing and publishing plant to cost $150,000. Anderson-Tully Company, Stuart, Ark., is having plans drawn for rebuilding of lumber mill to cost about $70,000. Pantex Pressing Machine Company, Houston, Tex., plans plant to cost about $100,000, with equipment. Boykin Machinery & Supply Company, Beaumont, Tex., plans additions to cost $85,000. Scobey Fireproof Storage Company, San Antonio, Tex., will soon take bids for a cold storage plant and dry storage warehouse to cost about $500,000. R. W. Alford, San Antonio, Tex., plans ice-manufacturing plant at Mercedes, Tex., to cost $70,000.

Pacific Coast

HEAVY machinery purchases featured the past week in the Pacific Coast district. The Pacific Gas & Electric Company alone placed orders totalling in excess of a million dollars. On the North Pacific motor sales to lumber mills and allied industries are increasing, but central-station buying is light.

The General Electric Company was awarded seven transformers for the Tiger Creek development, 20,000 kva., 220,000 volts, value $350,000; also fourteen F209 circuit breakers, value $85,000, also 29 steel trunk switchboards, value $150,000, for stations A and E in San Francisco and two condensers, 25,000 kva., value $220,000 for Newark. Westinghouse received orders for seven transformers, size 18,000 kva., for Newark, value $400,000, and Allis-Chalmers four 12,000-kva. transformers, value $100,000, for Salt Springs. Other power company buying includes one carload of crossarm braces, one mixed carload of bolts and shims, one carload of steel pins and two carloads of 45-ft. poles for the West Napa district, besides smaller quantities of wiring supplies for particular jobs. In general, however, this class of buying is light.

Railroad purchasing includes three carloads of No. 9 iron wire and one carload of steel strand. This business is expected to continue well into 1930 because of standardization of dispatching and signaling circuits over the entire Southern Pacific system, including recently acquired branch lines. There is great public interest in the proposed San Francisco purchase of approximately 500 poles for new boulevards and highways. Prices are steadier, though sales of conduit, rubber-covered wire and schedule material are perceptibly poorer.

Several orders for heavy apparatus for pulp and paper mills, grain elevator and central station in the Puget Sound district will be placed shortly. Motor sales were reported active last week. Allis-Chalmers Manufacturing Company sold $15,000 worth of castings to the city of Tacoma for No. 2 unit of the Lake Cushman hydro-electric project. Seattle central station purchases included in excess of $26,000 worth of lead-covered cable and 100,000 lb. of weatherproof copper wire, costing in excess of $18,000. The construction of high-tension power lines from Ruskin

to Burnaby, costing $750,000, and remodeling Burnaby substation for $220,000 are included in the program announced by the British Columbia Electric Railway Company. The line will be approximately 30 miles. Construction projects follow:

Southern California Edison Company, Los Angeles, Calif., will build a substation at Ontario, estimated to cost $75,000, and substation at Uplands to cost $35,000. San Francisco Bay Airdrome, Inc., Alameda, Calif., plans installation of floodlighting system and beacon lamps at proposed airport to cost $1,000,000. Pacific Gas & Electric Company, San Francisco, Calif., plans service and equipment building to cost about $100,000. American Concrete Pipe Company, San Diego, Calif., will build a manufacturing plant at Old Town, near San Diego, to cost $100,000. Los Angeles, El Cerrito, Whittier and Redwood City, Calif., plan ornamental street-lighting systems. Fir-Tex Insulating Board Corporation, Portland, Ore., has authorized fund of $2,500,000, for construction of mill at St. Helens, Ore. Crown Point Mines, Ltd., Baker, Ore., plans milling plant to cost more than $100,000. M. & M. Plywood Company, Longview, Wash., has approved plans for a plant to cost $100,000. Olympic Forest Products Company, Port Angeles, Wash., plans installation of a 5,000-hp. turbo-generator unit and auxiliary equipment for power service at mill, reported to cost $100,000. Puget Sound Pulp & Timber Company, Everett, Wash., will make extensions and improvements in lumber and sawmill at Clear Lake, Wash., to cost $150,000. Caldwell, Idaho, has authorized ornamental lighting system to cost $31,500. Bureau of Reclamation, Denver, Colo., will receive bids until October 24, for substation equipment for the Minidoke power plant, Minidoke, Idaho.

Activities of the Trade

Pacific Gas & Electric Orders New Equipment

Orders for power plant equipment totaling about a million dollars have been placed by the Pacific Gas & Electric Company, San Francisco. The plant in which the equipment is to be installed, the company receiving the order and the equipment it is to furnish follow:

For the Salt Springs power house, Allis Chalmers Manufacturing Company, four 12,000-kva. each, 11/110-kv. transformers.

For Tiger Creek power house, General Electric Company, seven 20,000-kva. each, 11/107.5/215-kv. combined transformers and auto-transformers.

For the Newark substation, Westinghouse Electric & Manufacturing Company, seven 18,000-kva. each 200/110/-11-kv. auto and straight transformers.

For the Newark substation, General Electric Company, two 25,000-kva. synchronous condensers. One of these condensers will be equipped with a 1,500-hp. synchronous driving motor so that the set may be used as a motor-generator set for the purpose of testing the lines radiating from Newark substation.

General Electric Supply Completes Organization

The General Electric Supply Corporation completed the consolidation of the fourteen wholesale distributing corporations owned by the General Electric Company on October 1, 1929, with officers and directors as previously announced.

The commercial organization will be headed by H. B. Tompkins, general sales manager, with headquarters at Bridgeport, Conn. The following have been appointed commercial vice-presidents: W. J. Keenan, Bridgeport; H. F. Thomas, Chicago; M. A. Pixley, Columbus; H. R. Noack, San Francisco.

H. R. Worthington will be general sales representative for the Southeastern States, with headquarters at Atlanta, and W. M. Goodwin for the Southwestern States, with headquarters at Dallas.

In the field there will be ten groups of houses called districts, headed by the following district managers, with district headquarters as indicated: New England, J. L. Busey, Boston; Metropolitan, J. G. Johannesen, New York; Atlantic, J. G. Johannesen, Philadelphia; Southeastern, J. J. Perry, Atlanta; Lake States, H. F. O'Malley, Columbus; Central, M. L. Spaulding, Chicago; Midwestern, E. A. Oas, St. Louis; Southwestern, H. E. Hobson, Dallas; Rocky Mountain, J. A. Kahn, Salt Lake City; Pacific, D. E. Harris, San Francisco.

Westinghouse Receives Street Railway Orders

To improving conditions in the electric street railway industry are attributed the large number of orders recently received by the Westinghouse Electric & Manufacturing Company for street car motors and control equipment valued at $3,500,000.

These orders include equipment for 100 cars for Cleveland (Ohio) Railway, 100 for Brooklyn (N. Y.) & Queens Transit Corporation, 60 for Chicago (Ill.) Surface Lines, 50 for Montreal (Que.) Tramways, 25 for Chicago (Ill.), North Shore & Milwaukee Railroad, ten for Columbus (Ohio), Hamilton & Dayton Railroad, twelve for Allegheny (Pa.) Valley Street Railway, thirteen for Youngstown (Ohio) Municipal Railway, twenty for Lynchburg (Va.) Traction & Light Company, fifteen for Scranton (Pa.) Railway, ten for Lake Shore (Ohio) Electric Railway.

These orders, incidentally, cover a new type of electrical equipment, according to Myles B. Lambert, transportation sales manager of the Westinghouse company in New York. The motors are quiet running and are capable of developing high speeds, and the controllers are arranged to permit quick but smooth starts with equally quick, smooth, rapid, safe and comfortable service to passengers. Attention is also paid to appearance and comfort.

Square D Company Host to Electrical Inspectors

The Square D Company of Detroit, manufacturer of a complete line of electrical control equipment, was host to the Western section of the International Association of Electrical Inspectors during its convention in Detroit recently. Special buses were chartered to the Square D factory and the visiting party was conducted on a tour of inspection through the plant.

BRYANT ELECTRIC COMPANY, Bridgeport, Conn., announces that F. S. Montgomery has been appointed advertising manager, succeeding E. I. Pratt, recently resigned to join Curtiss Flying Service in New York.

PETTINGELL-ANDREWS COMPANY has been established again at 372 Stuart Street, Boston, Mass., to take over the fixture business formerly operated by the General Electric Supply Corporation, of the same address.

LINK-BELT COMPANY, Chicago, announces that E. J. Burnell has become sales manager Western division, with headquarters in Chicago, while Nels Davis becomes manager of the Pittsburgh office.

ALTORFER BROTHERS COMPANY, Peoria, Ill., washing machine manufacturer, announces that J. J. Keith has become Eastern sales manager with headquarters in New York.

WHEELER INSULATED WIRE COMPANY, Bridgeport, Conn., has acquired property in Bridgeport for laboratory purposes. Olaf Isachsen is chief engineer.

TROY ENGINE & MACHINE COMPANY, Troy, Pa., has bought the plant, business and equipment of the Enberg Electric & Mechanical Works, St. Joseph, Mich.

BUFFALO ELECTRIC FURNACE CORPORATION, Buffalo, has been chartered for the manufacture of electric furnaces.

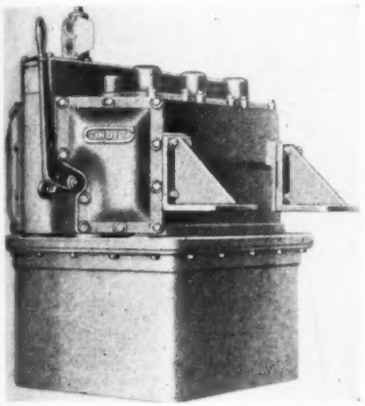
HI-VOLTAGE EQUIPMENT COMPANY, Cleveland, Ohio, manufacturer of outdoor switching and protective equipment, has appointed Lee Skipwith & Company, Inc., 369 Lexington Avenue, New York, N. Y., as a sales representative in the districts included in New York State, Pennsylvania, New Jersey, Delaware and Maryland.

New Equipment Available

Oil Circuit Breaker for Underground Service

A new manhole oil circuit breaker of moderate interrupting capacity, known as type M 210, for underground distribution service up to 15,000 volts, is announced by the Condit Electrical Manufacturing Corporation of Boston.

The new product is of sturdy watertight construction throughout and has a massive frame structure, heavily reinforced, which supports the operating



mechanism, bushings and current-carrying parts. In the upper part of the frame space is provided for two bushing type current transformers per pole, in connection with which up to six trip coils can be furnished. A light, rapidly accelerating mechanism assures high speed characteristics and easy operation, according to the manufacturer.

The type M-210 breaker is furnished for manual operation in three-pole, single-throw design for 400 amp. at 15,000 volts, non-automatic or full automatic trip-free, with an estimated interrupting capacity of 60,000 kva.

Hydraulic Feed Automatic Milling Machine

A newly designed, automatically operated hydraulic feed, bed type milling machine is announced by the Oesterlein Machine Company, Cincinnati, under the trade name Oesterlein No. 36 "Mil-O-Matic." The machine is designed to be available as single-spindle, duplex, vertical or multiple-spindle with several standard bed and table lengths. The new product is being demonstrated at the Machine Tool Builders' Exhibition at Cleveland.

The drive is unique in that the spindle head is an entirely self-contained unit. It carries its own motor, starting, stopping and reversing mechanism and control lever, as well as pick-off gears for determining the speed and all adjustable controls. It can be mounted at any angle or in any position to suit special requirements. Long shafts and bevel gears for bringing the power to the head are completely eliminated.

A 10-hp., 1,740-r.p.m. motor is required to drive each standard spindle to capacity, a 5-hp., 1,200-r.p.m. motor is required for driving the oil gear unit and a ½-hp. built-in motor is provided with the pump. The normal range of spindle speeds available is from 20 to 242 r.p.m. The feeds range from 0 to 30 in. per minute.

Overload Breakers for Small Motors

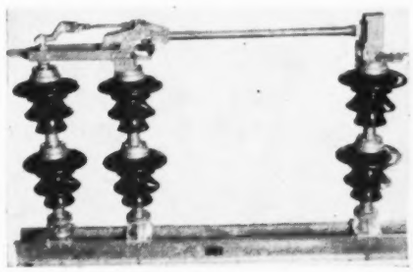
A complete line of overload breakers for fractional-horsepower, direct-current and alternating-current, single-phase and polyphase motors is announced by the Allen-Bradley Company, 286 Greenfield Avenue, Milwaukee, Wis., maker of automatic starting equipment.

The tremendous number of small individually driven tools and devices used in shops, stores and elsewhere suggested the development of these overload breakers. Reliable protection is afforded against motor burnouts and damage to the device due to overloads, thereby eliminating costly and troublesome maintenance work, according to the manufacturer.

Allen-Bradley overload breakers have a maximum rating of 1 hp. (125 volts) and 1½ hp. (220 volts) and may be obtained with or without snap switch or fuse clips. Six forms are designed to satisfy all industrial purposes.

Gang-Operated Three-Pole Disconnecting Switch

A new gang-operated three-pole switch has been developed by the Delta Star Electric Company, Chicago, and is used for motor or hand operation. The insulator stack is provided with



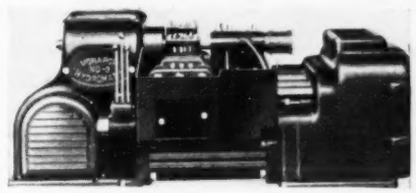
ball bearings, and through an improved mechanism mounted with ball bearings on the switch chassis first withdraws the blade from the fixed contact and then raises it to full open position. This switch is made for all commercial voltages from 15 kv. to 220 kv.

The rotating insulator is provided with a lever to which is attached the mechanism for interconnecting between units.

Hydraulic Automatic Lathe

A new application of hydraulics is employed in the new Monarch hydraulic automatic lathe which is being shown at the Cleveland Machine Tool Exhibition by the Monarch Machine Tool Company, Sidney, Ohio.

The headstock unit is a separate casting. All bearings are Timken. A powerful, easily adjusted Monarch Edgemont multiple-disk-driving clutch takes its power from the motor mounted in the base. The spindle is worm-driven and pick-off gears on the front of the headstock provide a quick means of securing any spindle speed desired. All working parts dip in oil. A coolant pump of 80 gal. per minute capacity is mounted in a headstock



housing and is driven from the main motor. One starting lever starts the spindle, coolant and hydraulic feeds on both carriages. The tail end housing contains the hydraulic mechanism, which is easily accessible through large doors on the end. A 2-hp. motor in this housing drives the two oil gear hydraulic pumps.

The tailstock clamps on the two inside 6-in. diameter bars. Tailstock spindles can be controlled manually, hydraulically or by air.

SINGLE ROW RADIAL BEARINGS designed to satisfy the demand for a roller bearing interchangeable with standard SAE single row ball bearings, but having greater load capacity, is announced by the Hyatt Roller Bearing Company, Newark, N. J. This new line is not intended to replace the standard Hyatt roller bearings, which use spirally wound rollers, but is offered as a supplement to it for positions in which space limitation exists and loads beyond the capacity of ball bearings must be sustained. The rollers are permanently retained with the outer race, the inner race being separable.

NOARK 30-AMP. ACCO OR ACCESSIBLE FUSE TYPE METER SERVICE SWITCHES are now being furnished with a new type cover by Colt's Patent Fire Arms Manufacturing Company, Hartford. It is necessary only to slide the cover of the fuse compartment a very short distance, even less than the width of the handle. It is stated that this is a valuable space saver in that it is now possible to gang these switches up closer together than when it was necessary to slide the cover of the fuse compartment almost the width of the box.

Electrical Patents

Announced by U. S. Patent Office

(Issued September 10, 1929)

1,728,031. ELECTRIC SWITCH; R. Bigenwald, Hirschgarten, Germany. App. filed Oct. 4, 1928.

1,728,034. EXHAUST HEAD; C. Bol, Eindhoven, Netherlands. App. filed Feb. 2, 1924.

1,728,038. AUTOMATIC CIRCUIT CONTROLLER; W. Bürstyn, Berlin-Wilmersdorf, Germany. App. filed Aug. 2, 1923.

1,728,037. ELECTRIC RELAY; H. E. Bucklen and H. O. Putt, Elkhart, Ind. App. filed June 10, 1927.

1,728,044. ELECTRICAL DISTRIBUTION SYSTEM; R. Dietze, Berlin-Pankow, Germany. App. filed March 16, 1928.

1,728,045. CONTROLLING DEVICE; W. Dubilier, New Rochelle, N. Y. App. filed Sept. 11, 1926.

1,728,048. METHOD OF AND APPARATUS FOR MOUNTING FILAMENTS; J. Flaws, Jr., West Orange, N. J. App. filed March 11, 1927.

1,728,049. COMBINED ELECTRIC LIGHTING FIXTURE AND CIGARETTE LIGHTER; A. W. Franklin, New York, N. Y. App. filed June 9, 1928.

1,728,052. ALUMINUM-WELDING ROD; H. Gilbert, Philadelphia, Pa. App. filed July 30, 1928.

1,728,054. ELECTRIC MOTOR; A. F. Godefry, Mexico, Mex. App. filed Feb. 25, 1927.

1,728,070. ELECTRIC FURNACE; P. L. J. Miguet, St. Julien-de-Maurienne, France. App. filed Dec. 23, 1927.

1,728,071. ELECTRODE FOR ELECTRIC FURNACES; P. L. J. Miguet, St.-Julien-de-Maurienne, France. App. filed Dec. 23, 1927.

1,728,073. SELENIUM CELL; J. Neale, London, England. App. filed June 6, 1928.

1,728,080. ELECTROTHERAPEUTIC APPARATUS; J. H. T. Roberts, London, England. App. filed Feb. 24, 1928.

1,728,090. CONNECTOR FOR EDGEWISE-WOUND RESISTANCE COILS; G. H. Wittingham, Baltimore, Md. App. filed May 29, 1926.

1,728,091. RESISTOR; G. H. Wittingham, Baltimore, Md. App. filed Dec. 27, 1926.

1,728,092. THERMAL RELAY; G. H. Wittingham, Baltimore, Md. App. filed March 31, 1927.

1,728,097. RADIATOR AND THE LIKE; J. V. H. Besson, Bourges, France. App. filed April 23, 1928.

1,728,105. ELECTRIC PROTECTIVE SYSTEM; H. W. Clothier, Wallsend-on-Tyne, and R. W. Biles, Balcombe, England. App. filed July 13, 1925.

1,728,110. MEANS FOR INDICATING EMPTY SEATS IN THEATERS; J. A. Dienelt, Alexandria, Va. App. filed Oct. 31, 1928.

1,728,119. CABLE CONSTRUCTION; B. W. Gates, Pleasantville, N. Y. App. filed Aug. 1, 1925.

1,728,121. RENEWABLE FUSE; C. J. Heatherington, McKeesport, and O. F. Collins, Duquesne, Pa. App. filed May 23, 1927.

1,728,135. ELECTROMAGNETIC STEPPING MECHANISM; N. L. Pillion, Nice, France. App. filed July 16, 1926.

1,728,143. SWITCH BOX; G. B. Wadsworth, Covington, Ky. App. filed Oct. 11, 1917.

1,728,167. MEANS FOR REMOVING STATIC ELECTRICITY; H. H. Olmstead, Wharton, N. J. App. filed May 26, 1928.

(Issued September 17, 1929)

17,436 (reissue). ELECTRIC CIGAR LIGHTER; A. Schoeller, Frankfort-on-the-Main, Germany. App. filed March 13, 1924.

1,728,170. CURRENT TRANSFORMER FOR HIGH-VOLTAGE BUSHINGS; A. O. Austin, near Barberton, O. App. filed Sept. 8, 1928.

1,728,174. WELDING ROD; J. R. Dawson, Flushing, N. Y. App. filed March 8, 1924.

1,728,175. CONTROL DEVICE FOR SECONDARY CLOCKS; A. L. Denniston and E. S. Ostler, Chicago, Ill. App. filed Sept. 18, 1924.

1,728,181. KNIFE BLOCK; C. T. Gould, Walpole, Mass. App. filed Feb. 20, 1928.

1,728,182. ELECTROLYTIC RECTIFIER; N. M. Hopkins, New York, N. Y. App. filed Feb. 1, 1921.

1,728,186. RHEOSTAT; E. H. Moore, Villa Park, Ill. App. filed July 8, 1922.

1,728,221. FUSE AND ITS INSULATOR; R. Terrild, Brooklyn, N. Y. App. filed Sept. 14, 1927.

1,728,222. ELECTRICAL SWITCH BOX; G. B. Wadsworth, Covington, Ky. App. filed Jan. 9, 1920.

1,728,234. PROCESS AND APPARATUS FOR PRODUCING LUMINOUS EFFECTS; H. J. Fanger, Oakland, Calif. App. filed April 18, 1927.

1,728,242. ELECTRICAL SWITCH; A. G. Lobley, Chapel-en-le-Frith, England. App. filed Sept. 22, 1926.

1,728,251. ELECTRIC SIGN-SOCKET; F. D. Pitt, Kansas City, Mo. App. filed Aug. 12, 1927.

1,728,271. CLOSURE FOR SWITCH BOXES; C. F. Gustin, La Grange, Ill. App. filed April 14, 1924.

1,728,280. CONDUIT-GROUNDING BUSHING; W. H. Vibber, New London, Conn. App. filed April 3, 1925.

1,728,288. RECTIFICATION OF POLYPHASE ELECTRICAL CURRENT; J. Jonas, Baden, Switzerland. App. filed March 6, 1926.

1,728,290. RECTIFIER SYSTEM; J. Kubler, Baden, Switzerland. App. filed Aug. 31, 1921.

1,728,291. THERMOSTATIC CONTROL FOR ELECTRIC HEATERS; F. Kuhn, Detroit, Mich. App. filed Oct. 5, 1927.

1,728,292. CIGAR LIGHTER; S. B. Lavick, Chicago, Ill. App. filed Sept. 19, 1927.

1,728,302. SIGNAL; J. Namet and P. McManaman, Cleveland, O. App. filed Aug. 26, 1925.

1,728,309. HEATER; L. D. Shreeve and G. H. Hillis, Phoenix, Ariz. App. filed Dec. 29, 1927.

1,728,319. TERMINAL PROTECTOR; C. F. Wilson, Troy, N. Y. App. filed April 27, 1928.

1,728,330. JUNCTION BLOCK FOR ELECTRIC CONDUCTORS; A. Bürli, Lucerne, Switzerland. App. filed March 3, 1927.

1,728,338. ELECTRICAL CLOCK; A. L. Jeanneret, Fils, La Chaux-de-Fonds, Switzerland. App. filed April 18, 1927.

1,728,345. SELECTIVE TUMBLER SWITCH; J. J. Hogan, Bridgeport, Conn. App. filed Oct. 31, 1928.

1,728,368. MASSAGE APPARATUS; T. Saxer, Rorschach, Switzerland. App. filed May 5, 1928.

1,728,371. HEAT-TREATING FURNACE; I. J. Shelton, Detroit, and C. V. Jacobi, Grosse Pointe Farms, Mich. App. filed Jan. 11, 1929.

1,728,377. ELECTRIC HEATER; R. N. Trane, La Crosse, Wis. App. filed May 4, 1928.

1,728,403. ALTERNATOR-FIELD-CONTROL SYSTEM; J. L. Finch, Brooklyn, N. Y. App. filed June 25, 1925.

1,728,439. SINGLE-PHASE-MOTOR SYSTEM; J. D. Nies, St. Charles, Ill. App. filed May 23, 1927.

1,728,446. ELECTRIC VAPORIZER; S. H. Rowland, Bath, Me. App. filed July 30, 1927.

1,728,450. ELECTROLYTIC HEATER; J. Slisz, East St. Louis, Mo. App. filed Jan. 28, 1928.

1,728,451. MAGNETIC ALLOY; W. S. Smith, Benchams, and H. J. Garnett, Lymne, and J. A. Holden, Sunnyside, England. App. filed May 3, 1928.

1,728,468. ADVERTISING DEVICE; F. E. Bessee, Los Angeles, Calif. App. filed June 18, 1928.

1,728,478. ELECTRIC LAMP; W. Dawson, London, England. App. filed May 23, 1927.

1,728,485. SCREW-SHELL CONTACT FOR ELECTRICAL SOCKETS; E. K. Freeman, Trenton, N. J. App. filed March 22, 1927.

1,728,522. INSULATOR FOR HIGH VOLTAGE SYSTEMS; F. G. Baum, San Francisco, Calif. App. filed Aug. 19, 1921.

1,728,531. HIGH VOLTAGE INSULATOR; W. Estorff, Berlin-Charlottenburg, Germany. App. filed June 4, 1927.

1,728,534. TELEPHONE PROTECTIVE SYSTEM; C. LeG. Fortescue, Pittsburgh, Pa. App. filed Aug. 8, 1927.

1,728,537. ELECTRICAL RECTIFIER; P. H. Geiger, Wilkinsburg, Pa. App. filed Aug. 25, 1927.

1,728,543. MOUNTING FOR ELECTRIC METERS; S. Hammer, Brooklyn, N. Y. App. filed June 10, 1927.

1,728,545. LINEMAN'S BLANKET; F. L. Haushalter, Akron, O. App. filed Feb. 14, 1924.

1,728,549. COMBINED SWITCH AND PLUG CAP; W. Huppert, New York, N. Y. App. filed May 21, 1926.

1,728,550. RELAY; O. S. Jennings, Brooklyn, N. Y. App. filed Aug. 6, 1920.

1,728,551. RELAY; O. S. Jennings, Brooklyn, N. Y. App. filed Aug. 6, 1920.

1,728,555. GALVANOMETER; J. W. Legg, Wilkinsburg, Pa. App. filed Dec. 23, 1924.

1,728,558. LIGHT SIGNAL; R. M. Gilson, Pittsburgh, Pa. App. filed Nov. 9, 1926.

1,728,559. LIGHTNING ARRESTER; L. R. Golladay, East Pittsburgh, and I. R. Smith, Pittsburgh, Pa. App. filed Feb. 1, 1927.

1,728,564. VENTILATING SYSTEM; F. T. Hague, Wilkinsburg, Pa. App. filed Sept. 13, 1926.

Information on foreign patents may be obtained through the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce.

New Trade Literature

PSYCHROMETERS.—Catalog No. 2100 has recently been issued by the Bristol Company, Waterbury, Conn., on the subject of recording psychrometers. The booklet opens with a discussion of the purpose of psychrometers, the places where they are used to advantage, a description of the instrument and how it operates. Under the headings "Self-Contained Type Recording Psychrometers," "Distance Type Recording Psychrometers," "Fixtures for Use with Recording Psychrometers" different types of this instrument are described by text and by numerous charts, diagrams and illustrations. The catalog contains an insert of list prices.

GAS-ELECTRIC BUS.—The "Gas-Electric Bus" is the title of folder D.M.F. 1214 recently released by the Westinghouse Electric & Manufacturing Company. This leaflet shows the important place the gas-electric bus is taking in the passenger transportation business due to its independence from fixed sources of power supply and the rail right-of-way required for the electric railway. The advantages of the gas-electric bus with photographs to illustrate make the booklet interesting to the layman.

MOTORS.—Seven types of squirrel cage motors are discussed and compared with each other in the new 24-page bulletin 165 issued by the Wagner Electric Corporation, under the headings of general purpose, normal-torque across-the-line, low-torque across-the-line, high-torque double-squirrel cage, punch press and elevator types. The bulletin is divided into several sections, one discussing the three factors interesting motor buyers (cost, performance and delivery), another analyzes and compares the starting and running characteristics of the various types of squirrel cage motors, and there are other sections devoted to detailed description of construction, ventilation, lubrication, and mechanical diversifications. Speed-torque curves, a table of comparative prices and a detailed table of electrical and mechanical characteristics, with a discussion of applications, are included in this bulletin. Histories of the development of double squirrel-cage motors, directed-draft ventilation and air-jacketed motors add reader interest to the bulletin.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Agency is sought in Liverpool, England (No. 41034), for electrical grooming brushes.

Agency is desired in Prague, Czechoslovakia (No. 41033), for electrotechnical novelties.

An agency is sought in Denmark, Copenhagen (No. 41032), for flashlights.

Either agency or purchase is sought in Amsterdam, Netherland (No. 41077), for electric generators.

Agency is sought in Buenos Aires, Argentina (No. 41025), for household appliances.

Agencies are sought in Berlin, Germany (No. 41035), and in Wellington, N. Z. (No. 41133), for household appliances.

An agency is sought in Regina, Sask. (No. 41027), for household fixtures and wiring supplies.

Agency and purchase are sought in Funchal, Madeira (No. 41023), for lighting plants and wiring supplies and for electric massage machines.

Agency is sought in Prague, Czechoslovakia (No. 41033), for small electrical motors.

Purchase is desired in Prague, Czechoslovakia (No. 41098), of phonograph motors, electromagnetic pick-ups and power amplifiers.

Agency is desired in Johannesburg, South Africa (No. 40030), for household ranges.

An agency is sought in Berlin, Germany (No. 41031), for electric refrigerators.

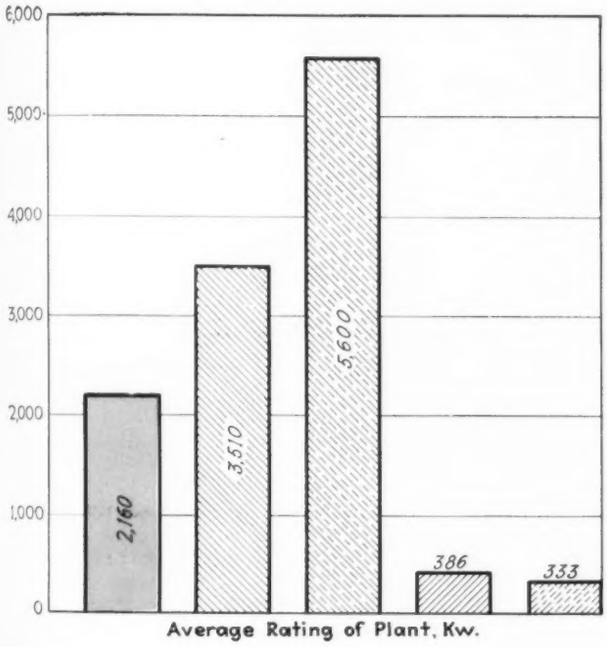
Business Facts for Electrical Men

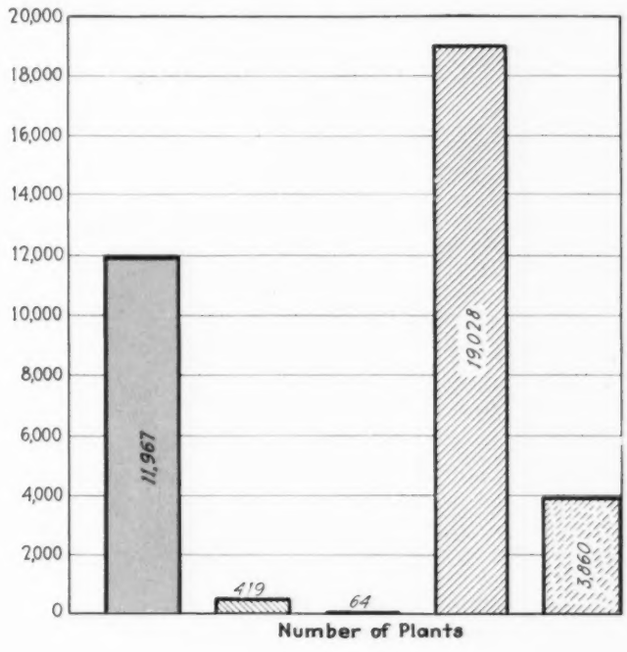
Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

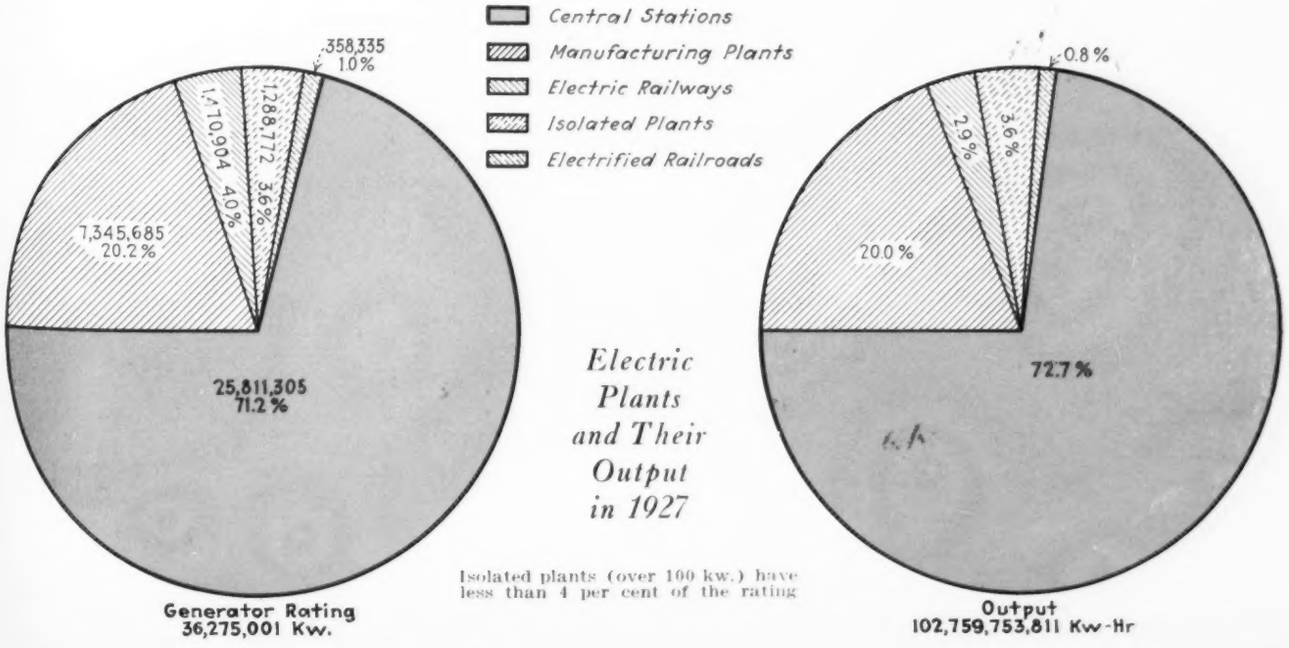
Who Generates Our Hundred Billion Kw.-Hr.?

THE largest power plants in the United States, in average size for the group, are those of electrically operated divisions of steam railroads. The largest individually are central-station plants. The most numerous are those owned by manufacturing establishments, but they are, in general, small.

In group capacity and output the central electric light and power stations far exceed all others combined, approaching three-fourths of the country's total in both respects. Other relationships will appear from the charts, which are based on a recent U. S. Census bulletin. "Isolated plants" includes those of mines and quarries, hotels, theaters, apartment houses, amusement parks, office buildings, and others.







Isolated plants (over 100 kw.) have less than 4 per cent of the rating

Southern Production Continues Over Last Year

THAT the larger manufacturing plants in the Southern States are maintaining production on a high plane is indicated by data received by the ELECTRICAL WORLD on the consumption of electrical energy from about 550 manufacturing plants operating in this section. The August rate of productive operations was 15.7 per cent over July and 17.7 per cent over August last year. The seasonal slump in operations which has been witnessed during the late spring and summer months of past years does not seem to be present this year, although there apparently was a material curtailment in general productive operations during July. There is now reason to believe that operations will be continued on a comparatively high plane during the remainder of the year.

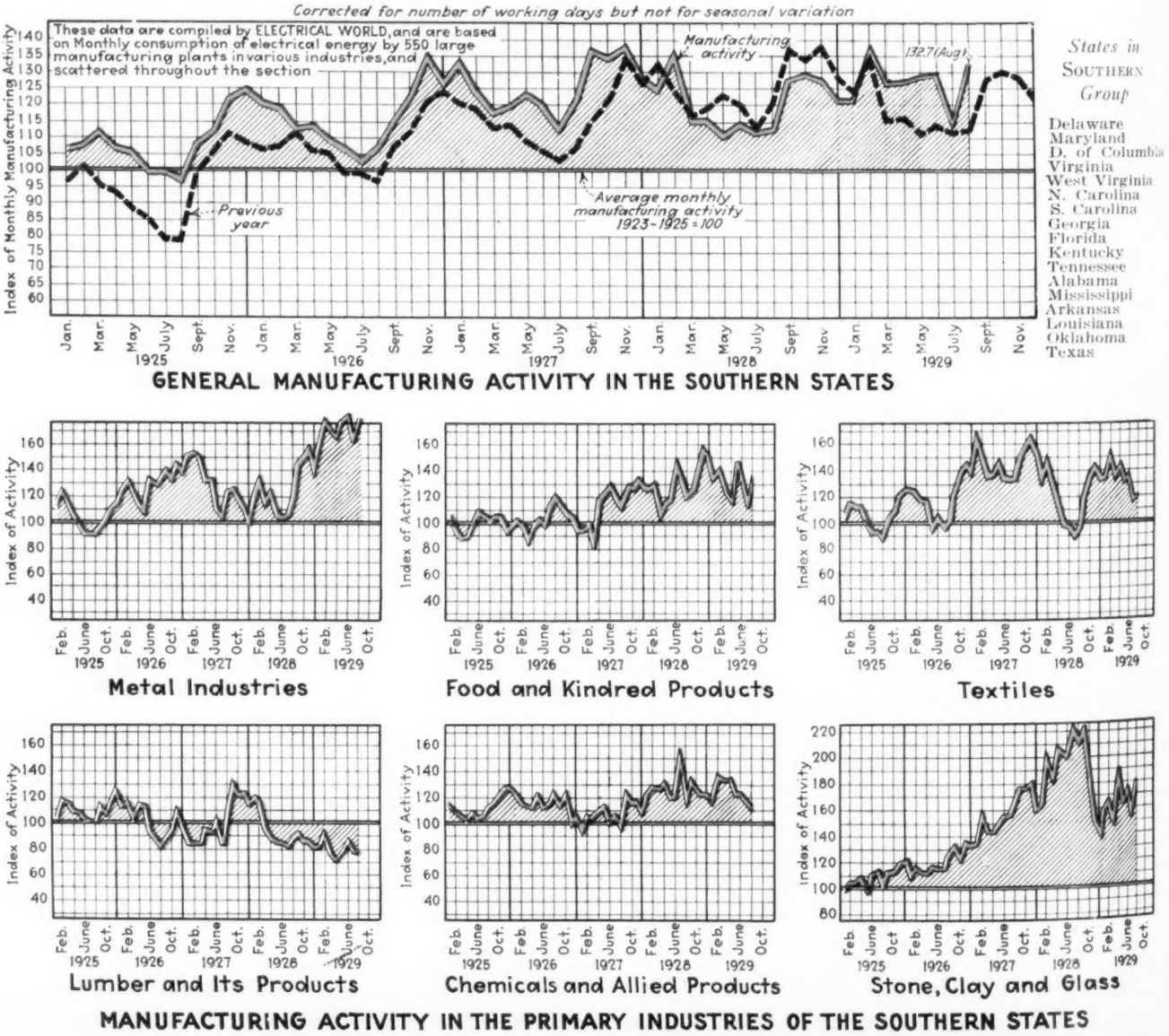
Five of the primary manufacturing groups of the South—rolling mills and steel plants, metal-working plants, food products, textiles and shipbuilding—report an August rate of operations over that reported for August last year. On the other hand, five important groups of the section—stone, clay and glass, paper and pulp, forest products, chemical products and rubber products—all report August operations under those of last year.

Materially improved conditions are reported by the textiles industry of the South as compared with conditions prevalent in August last year, with an increase in activity of 24.8 per cent. Current operations, however, are still about 10.2 per cent under the month of August, 1927.

Index of Productive Activity in the Southern States

(Average Monthly 1923—25 = 100)

All Figures Adjusted for Number of Working Days

	August, 1929	July, 1929	August, 1928	Average First Eight Months 1929	Average First Eight Months 1928
All industry	132.7	114.7	112.8	126.7	117.5
Metal-industries group	185.0	162.8	116.2	180.4	114.9
Rolling mills and steel plants	224.2	184.0	116.7	219.4	127.1
Metal-working plants	135.8	135.4	115.4	136.1	102.1
Food and kindred products	132.0	110.6	120.0	129.4	123.9
Stone, clay and glass	180.2	154.4	209.0	165.2	196.0
Textiles	118.8	117.7	95.2	133.6	111.7
Paper and pulp	134.7	146.3	152.5	148.4	148.7
Forest products	77.3	77.2	89.2	80.6	95.1
Fertilizer industry	60.6	26.4	16.9	95.9	65.0
Shipbuilding	86.5	98.2	75.8	95.6	
All industry (United States)	128.2	129.0	120.8	134.3	120.0

ELECTRICAL WORLD *Barometer of Industrial Activity in the Southern States*